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DIESEL RAILWAY TRACTION SUPPLEMENT

The June issue of THE RAILWAY GAZETTE *Supplement, illustrating and describing developments in Diesel Railway Traction, will be ready on June 1, price 1s.*

TO CALLERS AND TELEPHONERS

Until further notice our office hours are: Mondays to Fridays, 9.30 a.m. till 5.30 p.m.
The office is closed on Saturdays

ANSWERS TO ENQUIRIES

By reason of staff shortage due to enlistment, we regret that it is no longer possible for us to answer enquiries involving research, or to supply dates when articles appeared in back numbers, either by telephone or by letter

ERRORS, PAPER, AND PRINTING

Owing to shortage of staff and altered printing arrangements due to the war, and less time available for proof reading, we ask our readers' indulgence for typographical and other errors they may observe from time to time, also for poorer paper and printing compared with pre-war standards

Railway Engineering Supplies Exports

THE Board of Trade returns for April show that the railway engineering supply industries have made a considerable contribution to the increased export trade of the country. Obviously, it is not possible to differentiate between exports of new orders and those in which there may have been a considerable time-lag between the placing of the contract and the shipment of the product. Locomotives shipped in April numbered 37, of a tonnage of 1,623, and for the four months to April 30 the number was 105 and the tonnage 8,283. It is noteworthy that these latter figures compared with 59 locomotives and 4,950 tons for the first four months of 1938. On the basis of value, locomotive exports for the first four months of this year have amounted to £1,377,953, and this compares with £525,858 in a similar period of 1938. Locomotive parts exported so far this year are valued at £497,242 against £370,996 in the comparable four months of 1938. Complete wagons shipped had a total value of £1,270,259 this year, which compared with £491,180 in 1938, and axles, tyres, and wheels for locomotives, carriages, and wagons £821,217 against £79,019.

* * * *

The Nationalisation of Iron and Steel

The Council of the British Iron & Steel Federation, which represents the whole of the 480 firms comprising the industry, has unanimously approved a statement opposing the nationalisation of any section of the industry. It believes that it would be injurious to the efficiency of the industry itself, to developments in a wide range of allied industry, and to national recovery. Mr. Ellis Hunter, President of the British Iron & Steel Federation, has explained that the industry is not opposed to public supervision and, indeed, it operated willingly under it for several years before the war. Moreover, it welcomed the prospect of close co-operation with the Government in the reconstruction of the industry, and submitted a plan of development which would be carried out effectively and speedily, as plant and engineering resources were made available. The efficient organisation of the industry in the public interest can be achieved effectively and quickly only under the industry's plan and policy, and the nationalisation of sections of the industry would destroy the best hope of raising the general standard. He adds that the shadow of nationalisation already is frustrating the industry's major schemes of reconstruction.

* * * *

Sections to be Nationalised

In the two-day debate on the Government's iron and steel nationalisation motion in the House of Commons which commenced on Monday, Mr. John Wilmot, the Minister of Supply, gave a first indication of the extent of the Government's intentions. He said that sections to be nationalised included iron ore and those coke ovens of the industry not included in the Coal Board's operations; manufacture of pig-iron for all purposes and of steel ingots from pig-iron and scrap; primary and heavy rolling sections; various finishing operations which are so closely integrated with the actual iron and steel making as to form a virtual continuous process—in these cases whole plants will be included; spun pipe foundries invariably associated with blast furnaces. Iron foundries manufacturing iron castings and closely associated with engineering are to be left in private ownership.

* * * *

Road Hauliers' Opposition to Nationalisation

The opposition of the road haulage industry to the Government's nationalisation proposals is unabated and, under the auspices of the Road Haulage Association, a booklet* has been issued dealing with the evils of bureaucratic control of road transport. It has been compiled by Lt.-Colonel J. Dagleish, who was for a time Chief Transport Officer of the Military Government in Austria, and who also had served in Germany. He has dealt at length with the introduction of State control in Germany, the growth of the machine necessary to enforce it and, finally, with the breakdown of the system.

* "Germany was Beaten in 1943—State-controlled Transport Led to Failure!" Published by the Road Haulage Association, 146, New Bond Street, London, W.1. Price 1s.

Without fully agreeing to all the deductions Colonel Dagleish draws—one of which seems to be that State control of transport was the direct cause of the German defeat—the book is undoubtedly valuable as showing the natural outcome of Government control of bureaucracy and the spread of interference with the liberties of the citizen. In the early stages in Germany State control led to the immediate appointment of 18 Regional Road Transport Commissioners, 80 District Road Transport Officers, 1,500 Local Transport Officers and a clerical staff of more than 7,000. Ultimately, no haulier was allowed to start a journey over ten miles until he had received a written permit, and during the war a black market in transport was created.

* * * *

Assisting Engineering Exports

The British Engineers' Association has produced a carefully devised monograph on exports with the double object of affording a simple explanation of the economic background of export policies and a concise account of the technique and fundamentals of exporting practice. The latter is addressed primarily to engineering manufacturers who previously may not have had experience in export, or who may have relied for their export business on main contractors to whom they have acted as sub-contractors. In such cases, the potential exporter is advised to become familiar with the special characteristics of the overseas market which it may intend to enter, and some practical advice to this end is given, as also on the important subject of overseas representation. Export sales methods and procedure in exporting is also dealt with, and the importance of ensuring that publicity overseas shall be directed by advertising in those journals which reach the potential buyer is emphasised. Details are also given of the Government services available to exporters, and reference is also made to the use of the services of the British Export Trade Research Organisation, British Chambers of Commerce overseas, and the Dominions, India and Colonial Offices.

* * * *

The British Export Trade Research Organisation

A statement on the progress of the British Export Trade Research Organisation was made by Mr. Ivor Cooper, Chairman of the Council, at the first general meeting of the Organisation, which was held on May 22. He said that B.E.T.R.O. has now a headquarters staff of 82, organised under three main Divisions—Administration, Research, and Contacts. The scarcity of trained specialists was one of the most serious problems facing the Administration Division in its search for men both for its headquarters staff and overseas offices, and a trainee scheme had been organised for potential executives. The Research Division, responsible for the carrying out of trade and consumer investigations, and for the provision of a commercial information service, also directed the technical activity of the overseas branches. The Stockholm office, to cover Scandinavia, has been opened, and an office in Cairo will be established later in the year. An organisation in Buenos Aires, to deal with the Argentine market, has been set up, and a representative for India had been appointed. Attention was now being directed to secondary markets. A joint Standing Committee of the Board of Trade, B.E.T.R.O., and the Federation of British Industries, had been set up.

* * * *

Engineering Industry Reconversion

When Mr. George Isaacs, the Minister of Labour, addressed the annual meeting of the Confederation of Shipbuilding & Engineering Unions at Bournemouth recently, he said that there had been less dislocation in reconverting the engineering industry to civilian work than might have been expected. A serious problem was the shortage of certain classes of skilled workers, such as boiler platers, blacksmiths, electricians, and railway carriage and wagon builders, and wagon repairers. A shortage of these men was holding up production urgently needed in connection with the housing programme, and delaying the provision of essential rolling stock for the railways. Mr. Isaacs also dealt with the point which has been emphasised previously in these columns. This is the net shortage of some 21,000 skilled workers in the engineering industry as a whole. The very small pockets of skilled men in certain areas who are temporarily unemployed, are disappearing as factories are tooled up for civilian production. In stressing the importance of increased production, the Minister said that under-employment—the retention of skilled workers in factories when there was insufficient work for them to do—militated against achieving full employment, and he said that Government departments would expedite decisions and give clear information to firms where they might be placing orders.

* * * *

Free Railway Travel for Peers

On a motion by Lord Addison in the House of Lords on May 21, it was agreed that peers in regular attendance to their parliamentary duties should be entitled to recover the cost of railway fares incurred. A good case can be made for railway fares being refunded to members of the House of Lords, who receive no payment for work which is often valuable and arduous. But the point arises that in recent years there has been a considerable increase in the numbers of persons who are free railway travellers. Members of the House of Commons recently have had their free railway travel facilities increased. Civil service travel has grown enormously; the movement of members of commissions and committees, and other bodies that form our modern swollen bureaucracy, all tends to create a privileged travel class. In present circumstances their railway fare arrangement is merely a matter of Exchequer book-keeping, and in the event of the railways being nationalised, this will continue. With so many in high places enjoying free travel, the effective representation of the fare-paying passenger becomes less. With the early adjustment of railway fares and other charges to higher costs, the new form of passenger class distinction becomes increasingly valuable.

* * * *

The Pennsylvania Railroad Centenary

In connection with the centenary of incorporation on April 13, 1846, of the Pennsylvania Railroad Company, to which we made editorial reference in our May 24 issue, many interesting particulars have been issued. It appears that the Pennsylvania Railroad hauls more freight and carries more passengers than any other railway in the world. It operates daily 1,340 passenger trains and 3,170 freight trains over its system of 10,114 miles of line extending from the Atlantic to the River Mississippi. It thus works more miles of track than any other American railway. Although coal accounts for only 21 per cent. of the freight revenue, the Pennsylvania Railroad is the greatest coal carrier in the U.S.A. The company has some 218,000 stockholders, and has paid a cash return to its stockholders continuously since 1847, which is claimed to be the longest record of any American corporation. About one-half of the country's population and two-thirds of the country's wealth and resources are in territory reached by the Pennsylvania Railroad.

* * * *

Outer Suburban Stops of Express Trains

With the May timetables, the last of the stops made by Western Division express trains of the L.M.S.R. at Watford Junction, with six exceptions only (two of which are "semi-fast" trains), have been excised from the timetables. It was when the London blitz was at its height, in the winter of 1940-1941, that the decision was reached to make Watford a stop for nearly all the up expresses, and many in the down direction. Watford Junction is the terminus of the electric services, as well as a point from which many bus services radiate; and the purpose of the stop was to enable long-distance travellers to and from this area to avoid the additional time and risk entailed by going into and out of the heart of London during alerts. While the L.M.S.R. administration was located at Watford, also, this stop was of value for official reasons. In similar fashion the Southern Railway stopped its Western Section express trains at Woking. As the war proceeded, however, and air raid risks diminished, the loss of time and obstruction of the main line caused in this way brought about the withdrawal of the Woking stops; at Watford the obstruction has been worse, for the length of most main-line trains

has made a double drawing-up almost inevitable, but every successive timetable revision for some time past has seen more and more of the stops disappear, until the only important trains continuing to call are the 8.15 a.m. down Irish Mail from Euston, the 8.30 a.m. to Liverpool, and the 8.40 a.m. to Birmingham, with the corresponding 5 p.m. from Birmingham. It is idle to deny that the deprivation to residents in the whole of this populous area is severe, for it lengthens their journeys to and from the north by anything from 1¼ to 1½ hr. or more.

* * * *

Multiple-Aspect Signalling in Switzerland

Steady progress has been made in recent years in Switzerland in replacing the semaphore and disc type signals by colour-light signals, a step greatly facilitated by the ease with which electric power is obtainable at stations. This change is especially advantageous in view of the adoption of the overhead system of traction, and the difficulty met with in operating long wire transmissions in the severe winter conditions frequently encountered. Hitherto there has been no actual alteration in the signalling itself, although opportunity has been taken to improve the aspects given by the distant signals and enable them to indicate for both direct and diverging routes at the stop signal in advance. In 1941, however, with the introduction of automatic signalling between Zurich Central Station and Oerlikon, the multiple-aspect principle was adopted to reduce the number of signals required to be read by the drivers. This installation presents certain points of interest, and we are indebted to Herr E. Felber, Signal Superintendent at Berne, for the description of it appearing at page 596. Traction being single-phase, d.c. track circuits are quite satisfactory. The inductive A.T.C. apparatus has been arranged to work with the "caution" indications.

* * * *

The Accident at the Browney Signal Box

Colonel A. C. Trench's report on the accident at the Browney signal box, L.N.E.R., a summary of which is given elsewhere in this issue, shows the initial cause to have been the failure of a drawback of old design. The division in the goods train was signalled forward, but the signalman in advance, for various reasons, which he is not criticised for giving weight to, decided to stop the front portion. He was a relief man who had been five weeks in the box and had a wrong impression of the gradients. We have ourselves already commented on the recommendation of the coroner's jury concerned that gradients should be shown in all signal boxes, and the report supports our view. When the two portions collided, signal wires were fouled and false signal aspects shown to an approaching express, which ran into the wreckage. Ten lives were lost. It was largely an unfortunate combination of circumstances, but Colonel Trench feels obliged to criticise the Browney signalman—and to a lesser extent another—for not rising to the situation. He suggests re-opening experiments with pyrotechnic flares as emergency warnings in the hands of enginemen.

* * * *

"Make All Our Trumpets Speak"

"Waterloo,—dismal plain!" cried Victor Hugo, lamenting the defeat of Napoleon. But Hugo did not have the advantage of hearing the music from the loudspeakers that is interspersed with train announcements at Waterloo Station, Southern Railway, in the morning and evening hours. The Elizabethan barber provided his customers with a lute to beguile the time of waiting. The Southern Railway prefers scientific methods, but with the same purpose of banishing melancholy and encouraging the faint-hearted. Buying a railway ticket seems as solemn and irrevocable an act as resigning oneself to a long-deferred haircut. It is sometimes objected that there should be nothing about a station to divert the mind from its primary function of despatching and receiving trains. In that event such amenities of the terminal concourse as the buffet and the chemist's shop would have to go. There is all the more reason, then, for retaining music, which is both a stimulant and a sedative, and it is specially appropriate that at Waterloo, not far from the site of Shakespeare's Globe Theatre, we should be reminded of the stage direction, "*Exeunt Omnes*, with a flourish of trumpets."

Increased Railway Rates

IT will be recalled that one of the two main reasons for the revision, as from January 1, 1941, of the first financial agreement between the Government and the Railway Companies and L.P.T.B. under the Railway Control Order, 1939, was the desire of the Government to avert further increases in railway rates and fares, with a view to checking the upward movement in prices which the Government was anxious to stabilise.

Under the first agreement the Government should have adjusted railway rates and charges to meet variations in working costs and certain other conditions arising from the war. In fact, however, railway charges were raised only on May 1, 1940, by 10 per cent. above the 1939 level and on December 1, 1940, to 16·2/3rds per cent. (other than season-ticket rates, workmen's fares, which were exempt from this increase), although railway costs were then substantially in excess of that figure. The revised financial agreement operative from January 1, 1941, cancelled this arrangement, substituted a guaranteed annual payment to the controlled undertakings and provided that before Government control terminated, time would be given for the operation of any statutory machinery governing the level of charges.

The fact that the Government decided not to keep railway charges in line with railway costs did not matter seriously between 1940 and 1943 as, although expenditure showed a steady increase, gross receipts increased at a proportionately greater rate and the net revenue earned by the controlled undertakings rose each year by sums ranging from £16 to £20 millions each year. In 1944, however, came the turn of the tide, and expenditure rose more steeply than receipts. In 1945 the receipts showed a decline of about £10 million compared with the previous year, but expenditure rose again by £16 millions. During the present year the gross receipts in the first sixteen weeks have fallen by over £11 millions compared with last year, and although no expenditure figures are published, it is certain that they will not decline proportionately with the decline in traffic.

In March last Lord Portal said at the G.W.R. annual meeting that wages rates (not earnings) were 57 per cent. above pre-war, and the price of coal up by 123 per cent., and that an increase in railway charges more commensurate with the general price level was overdue. It is fairly common knowledge that active consideration is being given to the necessity for increasing rates and charges and that certain proposals to this end have been submitted to the Government, presumably by the Railway Executive Committee.

It was expected that the Minister of Transport would make an announcement early this week, but when he was asked in the House of Commons on May 27 what proposals he had recently received for an increase in railway rates, he replied merely that he hoped to make a statement at an early date. The Minister made his statement on Wednesday, when he announced that the increase will come into operation on July 1 next and that it will raise the general level of charges from 16⅔ per cent. over pre-war to from 25 to 33 per cent., with a continuation of the slightly preferential treatment which was accorded on the last occasion to season-ticket rates and workmen's fares.

* * * *

Carriage Construction Delay, G.W.R.

THE *Daily Express* on May 21 gave a circumstantial account of a labour dispute of a somewhat unusual kind, which has resulted in the complete cessation of the building of G.W.R. passenger carriages at Swindon since January last. The dispute apparently is not between the trade unions and the company, but is between the National Union of Vehicle Builders and the National Union of Railwaymen on a matter of "demarcation." The position is that on pre-war G.W.R. coaching stock the steel roof plates were fixed by coach-body makers, who are members of the N.U.V.B., to a wooden cant rail which runs along the top of the coach, whereas in the new stock now under construction, steel is being used more extensively and, in particular, the cant rail is now being made of light steel.

Because of this, and by analogy with other operations, the

N.U.R. contends that the work of fixing the steel roof plates to the cant rail should be performed by carriage fitters who are members of that union. The article also states that it has been made clear throughout the negotiations that it is immaterial to the company whether the work is performed by men belonging to the N.U.V.B. or N.U.R.

We understand that early this year a number of new coaches were ready for the roof plates to be fixed, and, as the unions still could not reach agreement, the whole of the 200 men involved were transferred temporarily to carriage repair work. In March last the company sought the intervention of the Ministry of Labour through the medium of the Railway Executive Committee, and reported the facts to the Ministry of Transport, but apparently it was not until May 8 that the Ministry of Labour arranged a meeting with the unions at Swindon. Once again agreement could not be reached, and the proceedings were concluded on the understanding that the unions concerned should consider a suggestion that the dispute should be referred to arbitration.

At the time of writing we learn that no date has yet been fixed for the commencement of arbitration proceedings. Obviously the employment of the men concerned on carriage repairs cannot be continued indefinitely, and we understand that, up to the present, the dispute has prevented the construction of at least 80 passenger coaches which were originally needed for the summer holiday traffic. As the company has frequently reiterated that it does not mind by which class of men the work is performed, it is unfortunate for the travelling public that the settlement of this comparatively trifling dispute is being so long delayed.

* * * *

Engineering Developments in Switzerland

DURING the war considerable research and development has been carried out by a number of firms in the Swiss engineering industry. To illustrate some of these developments, the Brown Boveri Company recently staged a series of demonstrations in its works at Baden, Switzerland, which was attended by over 400 guests from 30 different countries. The most important developments which were demonstrated can be summarised under the three headings:—(i) High-voltage electric-power transmission, (ii) electric traction for railways, and (iii) gas turbines for locomotives and for stationary power generation.

Developments in electric-power transmission include an investigation of the problems associated with the use of 400 kilovolts for long-distance lines, and the design of suitable transformers and circuit breakers for use with this voltage. Air-blast high-speed circuit breakers are advocated by the firm for general use on high-voltage systems, and a number of these circuit breakers were demonstrated in operation. For extra high-voltage systems multiple breaking is recommended, and automatic reclosing is provided for the clearing of arcing short circuits. The general question of stability of parallel operation with 3-phase power transmission over long distances (up to 1,000 kilometres) has also been investigated, including the conditions of automatic high-speed reclosing.

Power transmission with high voltage direct current is being developed by the firm and is believed to be an economical proposition for long distances owing to the reduced cost of the transmission lines. The critical distance above which d.c. shows an advantage is placed at 500 kilometres, but this distance is reduced to 200 kilometres if earth return can be used during service disturbances.

With electric traction, the main emphasis during the last few years has been on the design of power bogies for high-speed operation. The most advanced electric locomotive design produced by Brown Boveri is a Bo-Bo type, built for the Lötschberg Railway, developing 4,000 h.p. and having a total weight of only 80 tons. These machines are designed for a maximum speed of 125 kilometres/hour. Driving power is supplied by four 1,000 h.p. electric motors, mounted two on each bogie. The entire weight of the locomotive, of course, is available for adhesion. One of these new locomotives was demonstrated in operation with a special train on the Lötschberg Railway from Spiez to Kandersteg.

Gas-turbine locomotives are still in the experimental stage, but there is at least a possibility that this type of machine will eventually become a serious rival to the diesel locomotive, particularly in the higher power range. The principal advantages of the gas turbine are its mechanical simplicity and low initial cost compared with the diesel engine. The original Brown Boveri gas-turbine locomotive of 2,200 h.p., which was built in 1941, has not been used to any great extent during the war because of shortage of oil fuel in Switzerland. However, the locomotive is now in regular operation on the French Railways. A later design of gas-turbine locomotive having an output of 4,000 horsepower is at present under construction.

For stationary power generation, gas turbines are not yet able to compete with steam turbines on grounds of thermal efficiency. However, because of their low initial cost and simplicity of installation, they are particularly suitable for use as stand-by generating sets. The largest gas-turbine installation yet constructed by Brown Boveri has an output of 10,000 kilowatts and develops a maximum thermal efficiency of slightly over 23 per cent. on full load. In this installation the air compression is carried out in two stages, using two entirely separate axial flow air compressors each driven by its own turbine. The l.p. compressor raises the air pressure to 4 atmospheres, while the output pressure from the h.p. compressor is about 10 atmospheres. An intercooler is provided between the two compression stages. The exit pressure from the h.p. turbine is approximately 5 atmospheres. Output power is taken entirely from the l.p. turbine.

Further improvements in gas turbine efficiency and performance, of course, are dependant on the use of a higher compression ratio and higher gas temperatures in the turbine. The first problem is mainly a question of aerodynamics and compressor design, the difficulty being to achieve higher compression without sacrificing mechanical simplicity in multiplying excessively the number of stages. The second problem is primarily a question of metallurgical research. With existing turbine blade materials the temperature of the gas entering the turbine must be limited to about 600° C. If blade materials can be developed to stand higher temperatures, without any loss of strength or endurance properties, a substantial improvement in gas turbine efficiency could be achieved.

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The Baldwin-Westinghouse Turbine Locomotive

THE new non-condensing locomotive with geared turbine drive which has gone into service on the Pennsylvania Railroad is a development of considerable importance in railway history. Whatever the outcome of this experimental type, it cannot fail to be regarded as a most notable and courageous departure for which the Pennsylvania Railroad and the builders alike deserve a full measure of credit.

This is the kind of experiment on the grand scale which, so difficult to justify if it does not yield results that are immediately encouraging, is so necessary if real progress is to be made in locomotive engineering. In most countries which do not depend entirely upon imported locomotives, trials with new methods of propulsion have taken place from time to time. Yet such is the resilience and resource embodied in the conventional Stephensonian locomotive (and so considerable is the capital involved), that a locomotive on any other principle must show outstanding advantages if it is to have any chance of extended adoption.

There are many sad chapters in the histories of railways and of locomotive builders—both in this country and abroad—relating to the trial of some novel idea, which may seem to be brilliantly conceived and cleverly translated into metal, only to rank as a dire failure after the completion of a few anxiety-ridden trial trips.

What is worse, when a firm has had its fingers burnt over a venture of this kind, the time-honoured (and quite understandable) attitude it adopts is one of impenetrable reserve on the subject, so that no "outsider" can ever find out officially the real facts of the matter. This secretiveness has done an incalculable amount of damage to the development of locomotive design generally; and it is probably true to say that if full details of trials of certain experimental types had been made available reasonably soon after the conclusion of the tests, much duplication of projects doomed to failure need never

have occurred. Some official secrets were released twenty years late, in the discussion, last year, on the paper on "Condensing Locomotives," by Professor Lomonossoff and his son. This paper was reported in *The Railway Gazette* of June 2, 1944, page 570.

However, in the locomotive under review, such mournful reflections are hardly appropriate. It represents the fusion of the technical and manufacturing resources of two of the world's greatest heavy engineering concerns—the Baldwin Locomotive Works and the Westinghouse Electric & Manufacturing Company. Why, one may ask, should a turbine locomotive be considered at all, especially if the question of condensing is not contemplated?

The chief arguments in favour of the turbine drive are that, compared with the reciprocating locomotive, it develops 20 per cent. more power from a given boiler; it permits the use of smaller driving wheels and a lower centre of gravity; and it enables uniform torque to be achieved without reciprocating parts, dynamic augment, or unbalanced forces. Admittedly, the full theoretical advantage of steam turbine drive cannot be realised without condensing apparatus; but as Professor Lomonossoff has pointed out, the complications are so great and the advantage is so small in all but waterless climates as to be hardly justifiable—and even so, many difficulties still remain.

For countries such as Great Britain and the U.S.A., therefore, if a turbine drive is contemplated, it may very well be non-condensing, thus giving a much greater simplicity, with lower initial and maintenance costs. This was the view taken by Sir William Stanier when he designed No. 6202 on the L.M.S.R., the only British non-condensing turbine locomotive, which at the age of some twelve years, is still running with a fair measure of success.

The Baldwin-Westinghouse venture presents some extremely interesting and important features, many of which are mentioned in our article on page 598. It is the first direct-connected steam turbine locomotive in the U.S.A.; its power unit is designed as a completely self-contained assembly; and notable arrangement of three-point support obviates the transmission of any frame distortions to the gear case. Moreover, the control of the locomotive is vested in a single lever which governs both speed and direction (forwards or backwards). One of the major technical advances is embodied in the reduction gearing; hardened and ground double-helical gearing is here used commercially for the first time. This represents the most important development in this type of gearing since the first set was built by George Westinghouse in 1909. A special method of grinding, comprising a flat wheel in combination with a novel grinding rig, was evolved for the present gears by the Westinghouse Steam Division. Important, too, is the claim that the tooth loading of the high-speed pinion is practically double that ordinarily allowed.

For all its vast size and weight, the locomotive is not as complicated as one might expect. That is not to say, however, that in achieving a relative degree of simplicity, there were no formidable technical difficulties to be overcome. This turbine and its accessories form one long story of how such obstacles were surmounted; it is significant, indeed, that the Pennsylvania Railroad first considered geared steam turbines for locomotives as far back as 1937.

Apart from a consideration of the turbine, the boiler is perhaps the item of the greatest interest, as showing that even a working pressure as high as 310 lb. per sq. in. did not deflect the Pennsylvania from its loyalty to the Belpaire type of firebox. In the present instance the Belpaire form has been modified to include an immense combustion chamber, 10 ft. long, to suit the bituminous coal to be used and to ensure a reasonably close approach to complete combustion even when 6,900 shaft h.p. is being generated by the forward turbine.

For some time past, the locomotive has been undergoing main-line trials on the Pennsylvania Railroad; Mr. R. P. Johnson, Chief Engineer of the Baldwin Locomotive Works, stated that it had run about 15,000 miles in a satisfactory manner, and that tests with the dynamometer car would be made later. In view of the size and importance of the locomotive, and of the significance of the efforts which have been directed to its construction, we await the results of these tests with the greatest interest.

First Class or No Class?

AT one time the existence of various classes of society was accepted as a phenomenon that lent colour and variety to the human scene. Critical observations about other people's social background were not expected to be heard except among small boys, who indulged in them at the risk of being chastised for "making remarks." It would have been hard to foresee in those days that this bad habit would in time become a continuous undercurrent in public life. Already it is a pleasant surprise to read a newspaper which is not obliged to report at least one utterance of a kind that, whatever the spirit in which it was made, must give offence to some section of the community. Situations likely to provide material for criticisms of this kind are exploited and distorted. It was not long after the outbreak of war that the railways ran into the ill wind of abuse on the grounds that by providing first and third class accommodation, they were wilfully erecting a barrier between man and man.

The history of passenger class distinctions has been told in a book by Mr. Charles E. Lee, which was the subject of a leading article in our May 17 issue. Readers of the work will know that as far as the railways are concerned, class distinctions have been a matter of "penny plain, twopence coloured," or "you pays your money and you takes your choice." Applicants for first class tickets have never been asked their fathers' professions, as were some candidates for commissions in the Forces at the beginning of the past war. If some first class passengers think themselves superior to those in the third, nothing but penal measures against "dangerous thought," such as those which applied in pre-war Japan, can deal with the illusion, and even then we know proverbially what is the opinion of the man convinced against his will. The desire to secure some privilege or comfort not enjoyed by the majority, and the sense of satisfaction its realisation brings, must surely be familiar to all who have ever been to school or slept in a barrack hut.

First class travel was abolished on London Transport services before the war. Overcrowded passengers who resented the relative spaciousness of first class carriages were probably disappointed at the relief afforded, as indeed we are told the mass of people would be if all incomes were redistributed to give an equal amount to all. In time, no doubt, the public will tire of being called "the common people," when they observe that the adjective so eagerly seized upon today has long been applied by naturalists to the less interesting captives in zoological gardens. They will see, also, that the New Way of Life may be more attractive to those who make a living and a career out of planning it, than to the subjects of the experiment who find themselves obliged to live in houses of a certain type and to submit to the compulsory mixing of income groups. We often see the common man of Great Britain represented in newspaper cartoons as a noble figure in spotless dungarees, standing on a mountain top and looking towards a future represented by a rising sun of cartwheel size, labelled "The New Age." We prefer the conception of the Roman god Janus, who, being provided with eyes looking in both directions, could also observe the past and note that attempts to make human beings conform to a blueprint usually tempt their authors towards injustice and persecution, and reward them with the disapproval of posterity.

MANUFACTURE AND SALE OF MEASURING AND OTHER EQUIPMENT.—A. C. Wickman Limited, Coventry, announces that its American organisation, the Wickman Corporation, 15533 Woodrow Wilson Avenue, Detroit, Michigan, U.S.A., by arrangement with the Newall Engineering Co. Ltd., Peterborough, is to manufacture, and be sole selling agent and engineering representative for, the established and projected range of measuring equipment manufactured in England by Optical Measuring Tools Limited, 414 Montrose Avenue, Trading Estate, Slough, Bucks, a subsidiary of the Newall Engineering Co. Ltd., and of the Newall measuring machines. In addition, the Canadian company of A. C. Wickman Limited, A. C. Wickman (Canada) Limited, The Queensway, Etobicoke, Toronto, has been appointed sole selling agent and engineering representative in Canada for certain equipment of Optical Measuring Tools Limited, and the Newall jig borer manufactured by the Newall Engineering Co. Ltd., Peterborough.

LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

Diesel-Electric Locomotive Power

London. May 19

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—Twice recently you have been kind enough to let me point out the need for a trial of diesel-electric locomotives for main-line working on our railways. It is interesting to read on page 537 of your May 17 issue that the French railways have given us a lead by employing two diesel-electrics of 4,000 h.p. on the Paris-Mentone line. These units are reported to be doing good work and to have replaced seven large steam locomotives.

In your advertisement pages our railways announce that they intend to expand their research and experimental departments. They might start profitably with an examination of the results which the French railways have obtained from operating steam, electric and diesel-electric locomotives over their lines running south-east from Paris, which carry a dense traffic. Unless our railway managements display uncommon enterprise in investigating the latest developments of motive power, the leadership in the transport world will be lost for all time to the Continent and America.

Yours faithfully,

DUNELMIAN

Legal Control of Locomotive Design

United University Club, S.W.1
May 20

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—In the case of Parker *v.* L.N.E.R., decided on February 28, 1946, to which your article on page 531 in the May 17 issue refers, Mr. Justice Denning held that the omission to provide a spark arrester in a rebuilt "Claud Hamilton" engine constituted negligence on the part of the railway company. In the later case of Sellwood *v.* L.M.S.R., decided on May 13, 1946, Mr. Justice Hallett held that the omission to provide a spark arrester in a standard Fowler goods engine of the "4F" class did not constitute negligence on the part of the company. But Mr. Justice Hallett went on to hold that, although the Fowler engine had been properly constructed without a spark arrester, and had been properly maintained in good condition, the fact that sparks were ejected showed that the engine was being mismanaged at the moment by the driver and fireman, and that this mismanagement constituted negligence for which the company was liable.

The joint effect of these two decisions seems unsatisfactory. As the coal difficulty will be permanent, and steam locomotive design is hampered by British gauge limitations, we might well make a trial of diesel-electric traction which, as you show on page 533 of the May 17 issue, is giving wonderful service in America.

Yours faithfully,

W. B. THOMPSON

British Work on Persian Railways

The Cottage, Shobnall,
Burton-on-Trent. May 20

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—The account of the achievements and difficulties of the British troops on the Persian railway, which I am glad to see has been published by you as a separate brochure, is indeed an excellent description of the great many problems that had to be solved and the hardships that were met in the building of the very effective "Aid to Russia" route, over which so many thousands of tons of supplies were transported. ["British Work on Persian Railways," reprinted from articles in *The Railway Gazette* of February 2 and February 16, 1945, price 1s.—ED., *R.G.*]

I feel that it is my duty, however, to mention through the courtesy of your columns, the omission of one unit which undoubtedly contributed a great deal to the success of the working of the Trans-Iranian Railway route; I refer to the British Railway Telegraph Company, a unit of the Royal Corps of Signals, which was attached to the British Transportation Directorate, and should have been included in the force under Brigadier Sir Godfrey Rhodes. This unit proceeded to Persia along with the R.E. units, and shared all the hardships and difficulties.

Those who have read the account will recollect the mention of traffic control, and the installation of the selective ringing control system. The Railway Telegraph Company was faced not only with rebuilding and putting into order the existing dilapidated Persian telegraph routes, but also was called upon to instal and maintain all the apparatus associated with systems employed. This was satisfactorily completed, and the lines of communication, together with the equipment, were maintained by this unit from Khorramshahr to Teheran until handed over to the Americans in 1943. It will be appreciated that the Persian railway route could not have been efficiently organised without adequate communication between control staffs to give train details and all other necessary operating data. To this end the Railway Telegraph Company was responsible for setting up, manning and maintaining many large and small signal offices (several of which were equipped with teleprinters), all along the line of communications.

I hope that the above will show that the Railway Telegraphs did in fact form an integral part of the organisation which laid the foundation of this "Aid to Russia" route, and will therefore justify my calling attention to the unit concerned. In view of the extreme shortages of personnel, each individual of this unit did a good job of work in face of fearful difficulties of which the extremes of climate were by no means the least.

Finally, I would like to add my personal appreciation of the article entitled "The Railways in Iraq—1941-43" as published in *The Railway Gazette* of May 10, 1946, because we now have a complete picture and record of the two railways which played so great a part in the transportation of stores in "Aid to Russia."

Yours faithfully,

J. P. CUNLIFFE
Major, R. Signals.
Late Officer Commanding
No. 1 Railway Telegraph Company

Criticisms and Impressions

Ivy Chimneys, Mount Sion,
Tunbridge Wells. May 16

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—After a long absence (11 years in my case) one returns to England in a mood particularly alert and receptive of new impressions. Here are a few:—

1.—Name boards of stations should be as they are in India and as warnings on roads are everywhere, namely, at right angles to the direction of travel (not parallel to it).

2.—There should be adequate barrows and platform trollies at stations. Recently it took me 1½ hr. to clear a barrow load of personal luggage after arrival of my train at Waterloo. No porter would accept the job without a barrow. "Can't do nothing without a barrer, barrers are golden." In the end I had to find a "barrer" and bring it to the porter at the cost of some other suffering passenger.

3.—The enormous stores requirements of Indian Government departments such as the defence services, P.W.D., irrigation, railways, ordnance factories, the mint, hospitals, and so on, are purchased through a central department (Industries and Supplies), which includes in its functions the development of Indian industries. Thus British imports are barred except for articles which cannot be obtained from indigenous sources. There is nevertheless a vast field for export of high quality machinery, highly specialised manufactures (such as wireless sets), and consumer goods of almost every description. Where their own interests are concerned, Indians are shrewd buyers regardless of cost and origin, but it is absolutely vital to maintain high quality.

Yours faithfully,

R. O. C. THOMSON,
Controller of Stores, N.W. Rly. (India). On leave

Contemporary Account of the Tay Bridge Accident

Essex House, Essex Street, Strand,
London, W.C.2. May 7

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—In his privately-published "Reminiscences" (1911), James Stuart, Privy Councillor and sometime M.P. for Haggerston and Sunderland, records his recollections of the Tay Bridge disaster. He wrote:—

"I was at Balgonie at the time the Tay Bridge was blown over. . . . It was undoubtedly one of the most violent winds that ever took place in that neighbourhood. Our house was about twenty miles from the scene of the accident, and the howling of the wind in the roof and windows, and among the passages, was greater than anything that any of us had ever experienced. My mother became very nervous—a very unusual thing with her—and getting up from the supper table sat down in the armchair beside the fire, and several times

remarked: 'It is terrible!' in such a way as rather to alarm me and the rest of us, especially because of her unusual agitation. She said: 'It seems like the shrieks of dying people, and I cannot get them out of my head.'

"The next morning, when the post came, we received the newspaper from Edinburgh, but not that from Dundee, which caused some speculation, and soon we learned by a messenger from Markinch that there was no railway communication with Dundee, and then in the course of the day that the bridge had been blown down, much about the time that my mother had been so agitated. The bridge was blown down because the props were not sufficiently splayed, the whole thing being too vertical. The engineer who designed it was telegraped for, and came during the night in a special train from Edinburgh. It must have been a horrible journey. Curiously enough the mail bags which were being conveyed by the train were found by a casual traveller at Broughty Ferry, washed up within an hour of the accident. He carried them to the Dundee Post Office, and the letters were delivered, though somewhat damp, next morning at the same time as they would have been had there been no accident. I believe the engine was subsequently hauled up, and worked for many years, and one of the carriages was afterwards found on the coast of Holland. It seems that a good many people expected that the bridge would blow over, and some were watching it that night from their houses in Dundee, and one or two claim to have seen the accident, made evident by a long and sudden trail of sparks. A number of people were assembled at the Dundee Station through the night, fearing some accident to their friends who had not returned, and I have heard it said that the first intimation they received of the accident was from the stationmaster, who crept out in the darkness along the bridge until his course was arrested by the gap."

Yours faithfully,
KENNETH BROWN

Continental Traffic

Continental Traffic Managers' Committee
(G.W.R.—L.M.S.R.—L.N.E.R.—S.R.),
H. G. Williams, Secretary. 3, Grosvenor Gardens,
Secrétariat London, S.W.1. May 14
(Grands Réseaux Britanniques)
de liaison avec l'Union Internationale des Chemins de fer.

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—As a result of a recent decision of the General Managers of the four main-line railway companies, I am asked to advise you that the Secretariat of the Continental Traffic Managers' Committee has been established at this address.

The Committee is responsible to the General Managers for all matters of principle affecting the mutual interests of the British railways in connection with Continental and Channel Islands traffic.

In addition, the Committee will act as liaison between the British railways and the Continental railways, the International Union of Railways, and all other organisations dealing with matters affecting the various aspects of the International surface transport in which the British companies are interested.

I shall be glad if you will bring this arrangement to the notice of your readers concerned and I shall be very pleased to give any assistance or further information you may require.

Yours very truly,
L. H. K. NEIL,
Chairman, Continental Traffic Managers' Committee

Publications Received

Standard Methods of Analysis of Iron, Steel, and Ferro-Alloys. Third Edition. Sheffield: The United Steel Companies Limited. 9 in. × 6 in. 93 pp. Price 7s. 6d.—It has become proverbial that the "doctors disagree," and the same might be alleged against the analytical chemists at times; differing methods of diagnosis in the former case and of analysis in the latter doubtless provide the reason. The United Steel Companies have therefore rendered a useful service in bringing out a revised and enlarged third edition of this volume, which lays down the standard methods used by all the constituent branches of this large iron and steel combine in the analysis of iron, steel, and ferro-alloys. The book is in no small degree a tribute to the late Dr. T. Swinden, Director of Research of the United Steel Companies, who inspired its first production. Various methods are fully set out of analyses for aluminium, arsenic, carbon, chromium, cobalt, columbium, copper, lead, manganese, molybdenum, nickel, nitrogen, phosphorus, selenium, silicon, sulphur, tin, titanium, tungsten, vanadium, and zirconium in iron and steel; and for manganese, silicon, chromium, molybdenum, titanium, tungsten, and vanadium in the principal ferro-alloys. The book is produced in the admirably clear and well-printed style that characterises all the productions of the United Steel Companies, and should be of considerable value to analytical chemists.

The Story of British Railways. By Barrington Tatford. London: Sampson Low, Marston & Co. Ltd., 43, Ludgate Hill, E.C.4. 8½ in. × 6¼ in. 343 pp. Illustrated. 24 coloured plates. Price 21s.—The theme of this book is a commendable one, namely, that of presenting in one volume both an historical summary of the development of the British railways and a review of their present practice and achievements. This idea is also carried out in the illustrations, which include pre-grouping and present-day locomotives and trains. Illustrations are, to many purchasers, one of the chief attractions of a railway book. They will not be disappointed by the number presented in this volume, although the selection and quality are open to some criticism. The book includes 24 plates, reproduced from coloured sketches. This method does not allow of meticulous technical accuracy, but it might at least have set on record accurately for the benefit of the younger generation who will probably be the most numerous readers, the liveries adopted by the pre-grouping and present companies. Yet the coaches of an L.N.E.R. express look closer to G.W.R. chocolate and cream than teak, and elsewhere the umber of a L.B.S.C.R. tank engine has taken on a greenish tinge. Many of the half-tone illustrations are from official sources, and form a useful pictorial survey of modern locomotives, rolling stock, and railway equipment in general. Some of the other photographs reproduced show a tendency to blurring. The various railway histories are recounted with more detail than is usually found in popular books, although necessarily compressed, and the pages dealing with modern developments provide a useful introduction to the more detailed study that many readers will no doubt be led to make by what will doubtless prove an attractive book to the newcomer among railway enthusiasts.

Careers in Iron and Steel.—The efficiency of our basic industries in the difficult years ahead will depend largely on the care taken in recruiting the right type of men and on the training they receive. Recognising this fact, and in order to bring to the notice of parents, young men and educationists the opportunities of training for a career within their organisation, Dorman, Long & Co. Ltd., of Middlesbrough, has issued a pamphlet under the above title, "Careers in Iron and Steel," describing comprehensively the various departments and types of work which go to make up a large iron and steel business. Arrangements for apprenticeship, ordinary and special training, technical education and promotion are described in detail, and a clear picture is presented of the routes by which a recruit can reach whatever level in the organisation his ability may justify. About a year ago, the company created a number of special directorships which were filled by senior officials of the firm, and more recently three of them were appointed full members of the board.

War Achievements of the B.T.-H. Company.—We have received from the British Thomson-Houston Co. Ltd., Rugby, an illustrated brochure, prepared for overseas distribution, showing how the firm applied its wide experience and resources to the war effort. Almost overnight, indeed, its research laboratories were switched to wartime problems, and they collaborated intimately with Government establishments and the universities, with the result that much valuable work was accomplished, including the development of radio-location valves and radar and many other projects. Members of the staff of the B.T.-H. laboratories also took part in the scientific and engineering work of the development of the atomic bomb both in America and in this country. In this brochure, work carried out by the firm in connection with radar, jet propulsion for aircraft, the anti-acoustic mine device, the electrically-propelled torpedo, predictors, and other wartime products are reviewed and illustrated.

Timken Axle Boxes (publication No. 403). By British Timken Limited, Aston, Birmingham, 7. 9 in. × 6 in. 36 pp. Gratis. — This attractively produced booklet, which is printed on excellent paper and lavishly illustrated with over 40 photographs, together with a large number of neatly executed cross-sectional drawings, gives a comprehensive picture of the variety and extent of the application of Timken axleboxes in present-day railway practice throughout the world. A brief and readable introductory note sets out the case for roller bearings and gives some of the remarkable performances achieved with them; the remainder of the booklet consists of illustrated examples from steam, diesel, and electric locomotive practice, and from the passenger rolling stock of various countries, and concludes with a short illustrated section on the manufacture of these bearings at Birmingham and at Duston, Northampton.

The Scrap Heap

To pay public utility board chiefs salaries of £5,000 to £20,000 while the top salary for departmental chiefs in the Civil Service is £3,750 is obviously unfair.—*Mr. G. W. Morris, President, Post Office Workers' Union.*

* * *

FIRST ANTI-SUICIDE PIT

As ganger on Permanent Way of the Underground, Mr. Isaac Attwood, Acton Town, was responsible, in 1934, for making the first anti-suicide pit at Hyde Park Corner, work for which he was commended. He was at retiring age when the war was a year old, but he kept at his job, that of lengthman, for five-and-a-half years more.—*From "Pennyfare."*

* * *

PRECEPT ON P.R.O's

Lord Beaverbrook made public at the *Daily Mail* Jubilee Banquet a precept which he has often advocated to me privately.

"When a public relations officer wants us to print a story," he said, "we know it is propaganda, and we throw it away. But when a public relations officer asks us to suppress a story we know it's news, and we print it."—*From "The Londoner's Diary" in "The Evening Standard."*

* * *

100 YEARS AGO

From THE RAILWAY TIMES, *May* 30, 1846

GRAND JUNCTION RAILWAY.—ALTERATION OF THE MAIL TRAINS, by order of the Postmaster-General.—The public are requested to take Notice, that in pursuance of orders received from the Postmaster-General, the following changes will be made in the Mail-trains on and after the 1st June.

The Train leaving Edge-hill at 4 a.m., will be despatched from Lime-street at 6 a.m., will be accelerated to Birmingham, and reach London as at present. The Train will cease calling at Hartford, and private carriages and horses cannot be taken by it.

As the Manchester mails will hereafter be conveyed *via* Crewe, the Trains leaving Manchester for Warrington at 4 a.m., and Warrington for Manchester 4.27 a.m., will be discontinued.

An Additional Train will leave Parkside for Liverpool and Manchester respectively, on arrival of the early morning mail from the north at 6.10 a.m.

In consequence of the above changes,

The Second Class Train now leaving Liverpool at 6 a.m., will be despatched at 6. 15 a.m., and accelerated fifteen minutes to Birmingham.

The Third Class Train leaving Liverpool at 6.30 a.m., will be despatched at 7 a.m., and accelerated half an hour to Birmingham.

A Short Train (Mixed) will leave Crewe daily, Sundays excepted, for Liverpool and Manchester, at 7 a.m., calling at all the stations.

A Short Train (Mixed) will leave Birmingham daily, Sundays excepted, for Stafford at 9 a.m., calling at all the Stations, and return from Stafford at 6.45 p.m.

New Time Bills may be had at any of the Company's Stations on and after the 28th instant.

By order,

MARK HUISH.

General Manager's Office, Liverpool, 21st May, 1846.

RAZOR BLADES BENEFIT SERVICE CHARITIES

The L.M.S.R. official scheme for the collection of used razor blades among its staff has just been discontinued after yielding 2,000,000 blades. The disposal of these blades as salvage has resulted in the R.A.F., Airborne Forces, and Commando Benevolent Funds benefiting by an aggregate sum of £497.

* * *

NEXT WEEK'S RAILWAY CENTENARIES

Middlesbrough to Redcar (7½ miles), Middlesbrough & Redcar Railway, opened June 4, 1846.

Brighton to Lewes (8 miles), London & Brighton Railway, opened June 8, 1846.

Littlehampton (Lyminster) to Chichester (10½ miles), London & Brighton Railway, opened June 8, 1846.

* * *

STATION MILKING

A party of milkmaids waited at Berkhamsted L.M.S.R. Station, before dawn on May 9, ready to milk a dairy herd which was travelling overnight from Newcastle in a special train. When the train arrived at 4.20 a.m. the station at once became an emergency dairy. The girls were employees of Farmer Hunter, who was moving from Four Stones Farm, Newcastle, to Mile End Chapel Farm, Berkhamsted, and they travelled by road in advance of the train.

* * *

WHY?

Why do trains get delayed?

Trains get delayed because of lack of trained staff. The L.M.S.R. is today without 25,860 of its trained staff. The railwaymen directly concerned with the running of trains are all in the Operating Department. The number of operating staff still with the Forces is 14,213; the number demobilised and who have started work again with the company is 6,975. These, remember, are the trained men. Quite a lot of the trained men reached their normal retiring age during the war years, but they stayed on. Now many of them want to go.—*From "The L.M.S. Answers Your Questions."*

* * *

SPECKLED BAND WAGON

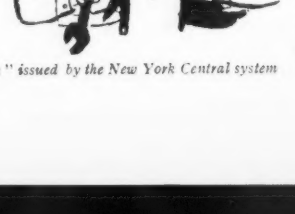
The Peshawar to Bombay express was held up for several hours near Itarsi on May 20 when a cobra was discovered in one of the carriages. The conductor, investigating the pulling of the communication cord, found some passengers, including women, huddled in the corner of a compartment, while a cobra was moving among their personal luggage. An Indian Army officer, whose help was summoned, shot the snake with his revolver. A few miles further on there was another alarm from the same compartment, and this time four snakes were found in possession. They were thrown out of the train, and the journey was completed without further incident.

[*Reproduced by permission of the proprietors of "Punch"*

PERSONAL QUESTIONS

Give the New Railroader a Hand!

Let's be sympathetic and helpful with the employee who has just joined the Railroad. He may be as green and bewildered as we were once. The treatment we give him at the start will color his whole attitude . . . and go far toward making him a valuable member of our transportation team.



[*From "Company Manners" issued by the New York Central system*

OVERSEAS RAILWAY AFFAIRS

(From our correspondents)

CANADA

Excursion Fares Again

Reduced railway fares between stations in Canada and from stations in Canada to United States border points were in force for the Easter holidays, and were the first low holiday rates since Government wartime restrictions on travel were lifted on March 15. The fares were based on single fare and a quarter for a return ticket. Tickets were available outwards from April 18 to 2 p.m. on Easter Monday, April 22, and for return up to midnight on April 23. Special Easter tickets for teachers and students were available outwards from April 5 to April 23, and for return up to May 7.

Underground Proposal for Montreal

The City Council of Montreal on April 2 presented a report calling on the Executive Committee to consider the advisability of tackling immediately the construction of an underground railway. The report stated that an underground system running north on St. Lawrence Boulevard from Craig Street, and east and west on St. Catherine Street, would cost an estimated $60,815,000. Its construction would give employment both in actual construction and in various plants supplying the material, to 8,400 men for a period of four years.

The Montreal move closely follows that of Toronto, where on January 1 citizens voted heavily in favour of a rapid transit subway proposal for their city.

UNITED STATES

Pennsylvania 4-4-6-4 Goods Locomotives

The Pennsylvania Railroad recently completed construction at its Altoona Works of 26 non-articulated 4-4-6-4 goods locomotives, of class "Q-2." The locomotives have two cylinders, 19¾ in. dia., by 28 in. stroke, driving the front four coupled wheels, and two cylinders of 23¾ in. dia. by 29 in. stroke driving the six-coupled unit. If either unit slips, power is automatically removed from it until slipping stops, when it is at once restored. The driving wheel diameter is 5 ft. 9 in., and the boiler pressure 300 lb. Tractive effort is rated at 100,800 lb., or 115,800 lb. with booster. Engine and tender have a total wheelbase of 107 ft. 7½ in. Weight of the locomotive in working order is 276 tons, and weight on drivers 175 tons. The locomotives are larger and more powerful than the "Q-1" class, in which the cylinders operating the rear unit were behind the driving wheels. In the "Q-2" class both pairs of cylinders are in front of the drivers they operate, which has enabled a deeper firebox to be used. The building of these locomotives was reported in *The Railway Gazette* of October 27, 1944.

The Railway Strike

The strike of 250,000 locomotive drivers and train crews, which had been postponed by a five-day truce declared on May 18, began on May 23, when the unions concerned decided that the concessions offered by President Truman were unacceptable. The unions concerned were the Brotherhood of Locomotive Engineers, and the Brotherhood of Railway Trainmen. Their original claim for a wage increase of 25 per cent. and a minimum rise of $2.5 a day was rejected by a fact-finding board, which recommended an increase of $1.28 a day. Later, the unions reduced their claim to a minimum rise of $1.44 dollars daily, but the railway companies adhered to the board's decision. President Truman intervened in the negotiations, and on May 17 signed an order under which the railways were seized by the Government and operated by the Office of Defense Transportation as from 4 p.m. on that date.

Negotiations continued, and a truce was declared on May 18, a bare quarter-hour before the strike was due to begin, the men remaining at work after the railways had come under Government control. In further discussions during the truce period, the President suggested a wage increase of $1.48 a day, provided the men withdrew for one year the changes sought in working rules. This proposal was considered by the unions to be less satisfactory than that of the fact-finding board, and the strike began on the expiry of the truce at 4 p.m. on May 23.

At the zero hour, nearly 1,000,000 people living in the suburbs or country districts around New York found themselves stranded in the city, and similar situations arose elsewhere. All road, water, rail, and air services still operating were ordered to pool their resources.

The strike was settled on May 25, when the unions agreed to accept the President's proposals reported above.

BRAZIL

Leopoldina Railway under Government Administration

A strike broke out on a portion of the British-owned Leopoldina Railway system after the National Labour Council had refused demands for general wage increases on the railway pending the completion of further essential inquiries. In order to restore its services to normal working as quickly as possible, and to minimise interference with the transport of food supplies destined for Rio de Janeiro, the company formally requested the assistance and intervention of the Brazilian Government. On May 22 it was announced that the Brazilian Government had appointed three Army colonels to administer the railway.

Roosevelt Station, San Paulo

By Decree-Law No. 7964 of September 18, 1945, the Norte Station in San Paulo was renamed Roosevelt Station in honour of the late President of the U.S.A.

New Railway in San Paulo

A Decree has been signed approving plans and estimates amounting to Cr. $118,828,247.70 for the building of a railway some 100 km. long between the town of San Paulo and Engenheiro Bley, on the Rêde de Viaçao Paraná-Santa Catharina.

Firewood and Sleepers

The Council of Forests has called the attention of the Minister of Agriculture to the inroads on forests made by railway requirements for firewood and sleepers. The Brazilian railway system is composed of 51 different lines covering a distance of approximately 34,251 km., which are laid with some 51,376,000 sleepers. Replacements require 6,000,000 sleepers a year, though this total has been somewhat reduced in recent years by shortage of supply, aggravated by deficiencies of wagons and labour. The Mogyana Railway alone, with its 1,985 km. of line, maintains 3,000,000 sleepers in use, though replacements have been reduced from 388,028 in 1936, to 199,677 in 1944, on account of scarcity of supplies.

The consumption of wood fuel by the 51 railways above mentioned was put at 9,554,499 cu. m. in 1940, and this total has increased considerably since then because of the shortage of coal; in 1943 the railways of the State of San Paulo alone consumed 7,445,516 cu. m. Of these the Sorocabana Railway burned 2,166,669 cu. m. For fuel and maintenance of track, it is estimated that between 32 and 35 thousand Brazilian hectares of forest land are razed annually.

WESTERN AUSTRALIA

Transfer of Electric Supply Undertaking

Under the Government Electric Works Act, 1914, the Government electricity supply undertaking operating throughout the Perth Metropolitan and suburban area has been administered by the Commissioner of Railways of Western Australia under the management of Mr. W. H. Taylor, General Manager, Tramways, Ferries & Electricity Supply. By the State Electricity Commission Act of 1945, the existing Government electricity supply undertaking was transferred from the control of the Commissioner of Railways to that of the State Electricity Commission constituted under the Act. At June 30, 1945, the electricity supply represented a capital outlay of £1,996,820, but a new power station now under construction at South Fremantle will increase this by approximately £2,000,000.

The State Electricity Commission Act was proclaimed by the Government to operate from March 20, 1946, but it was not practicable for the commission to take over the affairs of the existing undertaking immediately. Accordingly they will remain under the control of the Commissioner of Railways until the end of the financial year on June 30 next. The Government electric tramways and Government ferries will continue to be under the control of the Commissioner.

INDIA

Attempt to Wreck Passenger Train

An attempt to wreck 76 down passenger train between Jullunder and Amritsar was made on the evening of April 30 by tying machinery to the railway track with wire. The driver observed the obstruction and succeeded in bringing the train to a stop before much damage could be done. The engine and two bogies were damaged.

Four-Hour Strike on N.W.R.

A four-hour strike on the North-Western Railway, called by the Central Strike Committee against the advice of the All-India Railwaymen's Federation, passed off peacefully on May 1. The strike was complete in the workshops, but on the open line was either partial or a failure, and only four trains were seriously delayed.

Strike Called for June 28

The General Council of the All-India Railwaymen's Federation, representing 1,000,000 railway workers in 23 unions throughout India, decided after a secret all-India ballot to give the Government of India notice on June 1 that railwaymen on all railways, including those in Indian States, will go on strike from June 28 unless their demands are conceded by that date. The A.I.R.F. demands settlement by adjudication of their main claims which are: (1) No retrenchment; (2) revision of scales of pay; (3) adequate dearness allowance; (4) three months' pay as bonus. Claiming that this would sidetrack the

main issue, the council has refused to co-operate in the separate adjudication of its claims respecting leave rules and working hours to which the Government of India has agreed. The public is relieved by the ample notice which has been given, and it is hoped that a compromise, averting direct action, will be reached before the end of June.

All-Metal Coach Built in India

The Hindustan Aircraft Factory, Bangalore, has completed the first all-metal railway coach constructed there under orders placed by the Government of India. The coach has been handed over to the M. & S.M. Railway for trial, and if the trial proves satisfactory the coach will be sent to Delhi for approval of the Railway Board. The coach, which is built entirely from indigenous materials, embodies the latest features of design and is slightly larger than the standard coach.

Jamnagar & Dwarka Railway

A five-year programme of rehabilitation and renewals has been embarked upon by the Jamnagar & Dwarka Railway (metre gauge) in the State of Nawanagar, North-Western India. Orders have been placed in Great Britain for two locomotives and a boiler; with the Railway Board in India for 10 locomotives, 700 wagons, and 50 carriage underframes; and in the United States for 6 diesel locomotives. The British locomotives will be delivered in July this year, and the items which are being built in India will become available between 1947 and 1952. New machinery for maintenance purposes will be installed at the railway workshops, involving an expenditure of about Rs. 26 lakhs. Modernisation and improvement works will take place at Jamnagar Station.

The railway proposes to add an additional mileage of 212 to its existing system, which now has a route-mileage of 199. Buffet cars are to be provided on the principal trains, and refreshment facilities at stations will be improved. It is also intended to build 260 miles of new roads on which buses will be run in co-ordination with the train services to provide communication with places where direct rail connection is not practicable.

SOUTH AFRICA

Railways and the Food Shortage

The railways are in the first line of the fight against a food shortage this winter in the Union, it was stated officially in Cape Town recently. The prompt transport of foodstuffs has become vitally important, and railway wagons have, as a first priority, to be assigned to the task of conveying seed, grain, and potatoes to the producing areas, and of maintaining the distribution of maize, wheat, and other foodstuffs throughout the country. These obligations have complicated the wagon position of the railways, which is still inadequate in relation to the growing needs of the country. In a large measure the failure of the wheat and maize crop as the result of the drought is responsible for the extreme tightness of the wagon position. Foodstuffs have to be transported from the ports to the interior without delay. Internal traffic has also remained at a high level. The movement of drought-stricken stock, the transport of chrome and manganese, meat, vegetables, and deciduous fruit, and the supply of manure and fertilisers to the grain-producing areas have all combined to place a constant strain on available wagon stocks.

In order to meet wagon demands a seven-day week now applies on the railways, and intensive turn-round working is in force. These energetic measures have met with considerable success. Despatches from the ports are being well maintained, coal transported from the collieries is increasing, and the demand for wagons at inland centres is being met to a substantial degree. Generally speaking, however, commitments all round far exceed the wagon resources of the railways, and a most difficult period may be expected, especially in view of the heavy imports of foodstuffs.

KENYA & UGANDA

Movement of Seasonal Crops

The movement of seasonal crops is now in full swing throughout Kenya & Uganda, and the usual heavy demands are being made on the Railway Administration for wagon capacity. In addressing the Railway Priorities Committee at its first meeting of the season, the Director of Produce Disposal said that the East African Territories as a whole were confronted by a serious food situation; it had not been possible to create any reserve, and certain areas were living from hand to mouth. As Kenya was the main supply centre, he asked for the highest priority to be given to the movement of food to the points where it was most urgently needed. The Chairman said that other heavy traffics competing for wagon space included baled cotton and cotton seed from Uganda, coffee, sugar, sisal, timber, soda ash (from Magadi), and wattle bark.

The transport problem was complicated this year by the return of the East African forces from S.E.A.C. and the Middle East, and by the demobilisation programme. During one week-end 10,500 troops had been moved, and the movement of large numbers of troops in covered goods wagons seriously interfered with wagon turnround.

The rapid disappearance from service, owing to defective wheels, of the 380 wagons received from the United States in 1944 had not made the position any easier. Transport across Lake Victoria was affected by the accident to the ss. *Usoga* and by loading restrictions to meet low lake levels. Bulk storage was lacking in Uganda & Kenya, a factor which increased the pressure on the railway to move the traffic as quickly as possible. Import traffic was also showing a marked increase.

The Chairman said that the railway could move all the traffic in time, but not all the traffic at the same time, and it was only by exercising the closest control that a co-ordinated movement of traffic could be achieved, which would ensure that food supplies were distributed adequately where needed and that adequate stocks of export traffic were built up at the coast so that all available shipping space should be taken up. Unfortunately, he added, it would be necessary in the operation of this control to curtail the movement of certain produce, the movement of soda ash, for example, would have to be reduced (temporarily, he hoped) in spite of an urgent world demand.

Railway Stores

During 1945 stores and material of a total value of £765,242 were received, while issues amounted to £800,816. Stocks on hand at the close of the year were valued at £547,112. This figure is inflated by the present high price level, which it is estimated now stands at 160 against an index figure of 100 for 1939. Purchases of local produce and locally-manufactured articles reached a figure of £140,000. This included timber purchases to the value of some £36,000 from Kenya & Uganda forests. Over £67,000 worth of articles, chiefly locomotive, carriage and wagon spares, were manufactured in the railway workshops.

ITALY

Genoa—Spezia Line Re-opened

The main line from Genoa to Spezia, 56 miles, was re-opened to traffic early in March, after completion of extensive repairs to war damage. Many viaducts and bridges had been destroyed.

SWITZERLAND

Brown Boveri Demonstrations

From May 14 to 16 over four hundred guests from thirty different countries attended a congress at the Baden works of the Brown Boveri Company. Mr. B. Vodoz, Director, in an address of welcome, said that the war had naturally affected their relations with the outside world. The position of Switzerland had been that of an island surrounded by raging seas. The conflagration over, and with easier travelling restored between the different countries, this gathering of engineers had been called together for the two-fold purpose of renewing their personal connections with customers and showing them some of the progress realised during the long years of separation. The demonstrations are dealt with in an editorial article on page 588. The firm of Brown Boveri was founded in 1891 by Walter Boveri and Charles Brown and has a share capital of 37½ million Swiss francs. The present Chairman is Dr. Walter Boveri, the son of one of the co-founders. Of the 7,500 employees at the Baden works, 5,500 are workmen; the remainder is made up of the commercial and technical staffs, of which the latter alone comprise 1,200 engineers and technicians.

Electrification at Basle Main Station

Work began on March 25 on the electrification of all approach lines, sidings, and shunting lines at Basle Main Station, Swiss Federal Railways, with the object of abolishing all steam shunting at the station and its environs. At the present time the tracks of the French National Railways from Mulhouse are not electrified, neither is the connecting line to the Reichsbahn station, and numerous lines used for shunting and marshalling trains for the French and German systems are also steam-worked. The electrification will cost fr. 574,000. It will take a considerable time to complete, since the work must be carried out without interrupting traffic, and various lines will have to be lowered where they pass under road bridges to make room for the overhead current conductors.

New Locomotives and Rolling Stock

At a recent meeting the board of the Swiss Federal Railways decided on the acquisition of a further ten "Re 4/4" light electric locomotives for lightweight fast trains, in addition to nine electric shunters. The necessary credits were granted for the purchase of 46 light steel coaches, 4 restaurant cars, 15 standard-gauge and metre-gauge luggage vans, and 50 standard-gauge and metre-gauge covered wagons. One of the standard-gauge light steel luggage vans will be fitted with a driver's cab in order to test remote control of an "Re 4/4" locomotive.

Measuring Screw Thread Diameters

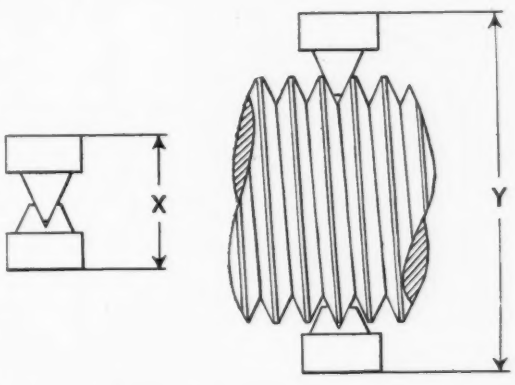
New gauges with small linear measuring surface to ensure maintenance of accuracy

IT is recognised that the effective diameter of a screw thread is the most important dimension which has to be kept within certain specified limits. This, however, presents certain problems, some of which are enumerated below.

Until now the most accurate way of checking positively the effective diameter has been the three-wire method. For this, however, an expensive measuring instrument and a set of "best-size wires" have been required, and the process of checking has been cumbersome. Optical means are sometimes employed in inspection and other departments, but their cost and their inability to withstand machine shop vibrations limit their usefulness. Screw-thread micrometers are often used to measure the effective diameter, but to measure, for instance, $\frac{5}{8}$ in. bolt size and everything intermediate up to 6 in. B.S.P. size, requires a number of micrometers. Furthermore, they do not retain their initial accuracy for long, on account of the small surface of contact.

Limit gauges are frequently used in inspection departments and machine shops; however, the advent of quality control no longer tolerates this method since these gauges do not indicate the actual dimension. Ring gauges, of course, do not show any thread errors until the thread to be measured is undersize and probably scrap.

A new and accurate method of performing the work is provided by the Marlco thread measuring parallels, made by W. H. Marley & Co. Ltd., New Southgate Works, 105, High Road, London, N.11. They were designed and made in collaboration with the National Physical Laboratory and embody the well-established principle of measuring the effective diameter by means of a wedge and a vee, similarly to a screw-thread micrometer, but instead of a linear measuring surface these parallels have a gauging surface of 0.5 in. and therefore retain their accuracy for a correspondingly longer period. They are guaranteed to determine the effective diameter within 0.0002 in. and N.P.L. certificates can be supplied to this effect. At the same time their application is simple, as shown in the drawing reproduced, the required dimension being found by subtracting dimension "X" from dimension "Y."

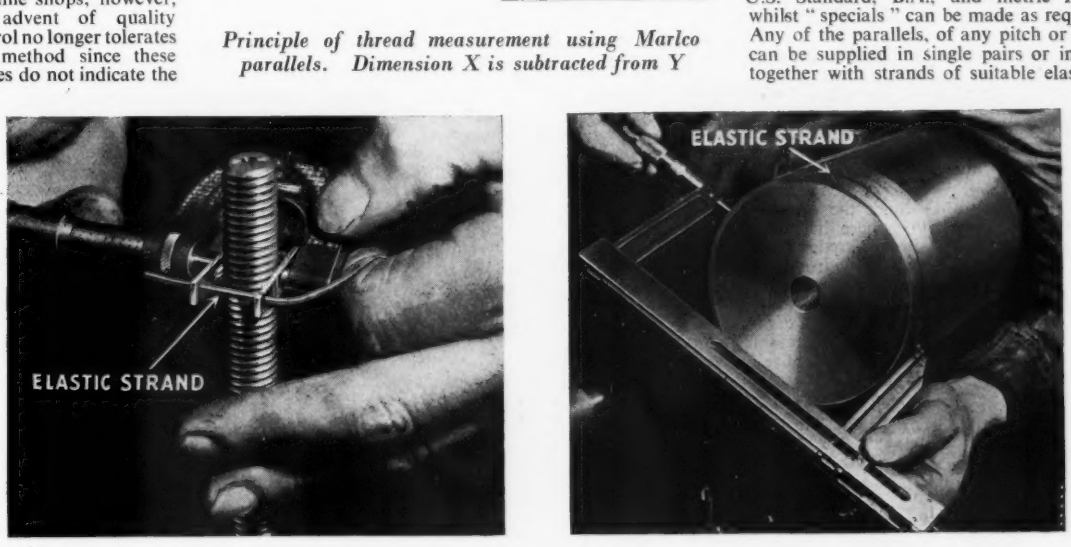


Principle of thread measurement using Marlco parallels. Dimension X is subtracted from Y

In this way the man in the shop has not to rely—as in the case of limit gauges—upon his personal judgment, but can see at a glance how much material has to be removed so that the machined part comes within the specification limits.

To simplify the process of measuring, an elastic strand is used to form a linkage, as shown in the photographic illustrations. It will also be observed that this arrangement will allow the checking of any effective diameter irrespective of size or sense of helix angle, that is, R.H. or L.H. threads of any diameter can be measured with one pair of parallels of the appropriate range. Furthermore, this system of linkage will allow the measuring of components on the machine or between centres, as the elastic strands can be threaded into the slots of the parallels before or after they are placed in contact with the work piece. In this connection it may be noted that the degree of accuracy obtained here depends mainly upon the precision of the gauge used to determine the sizes "X" and "Y," and any suitable measuring device can be used.

The gauges are designed and grouped to form sets covering threads of Whitworth, U.S. Standard, B.A., and metric forms, whilst "specials" can be made as required. Any of the parallels, of any pitch or form, can be supplied in single pairs or in sets, together with strands of suitable elastic.



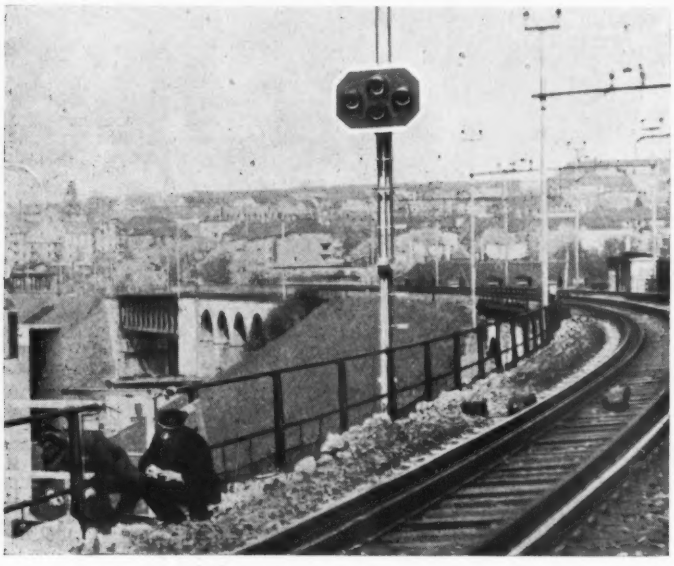
Use of parallels to measure $\frac{5}{8}$ in. Whitworth (left) and 6 in. B.S.P. (right)

L.P.T.B. DEVELOPMENT PROGRAMME.—Mr. J. H. Brebner, Chief Public Relations & Publicity Officer, London Passenger Transport Board, in the course of a speech at a recent luncheon of Hackney Rotary Club, announced that the Board was introducing a large and comprehensive scheme of development covering extensive areas north and south of the Thames. The new programme embraced more frequent services at all hours of the day on 55 central bus routes, later journeys on 32 central and 25 country bus routes, extensions to the country and riverside at weekends on 20 central bus routes, and improvements to country services, including the opening of four new Green Line coach routes and of six new bus routes in country districts. The improvements would require the daily running of 1,100 more buses in normal hours and 490 more in peak periods than had been running on VE-Day. To work the extra buses almost 3,000 additional bus crews had been recruited and trained. Speaking of new works, Mr. Brebner said that the L.P.T.B. had commenced work at both ends of the Central Line—a 23-mile extension to Stratford, Leyton, and Ongar in the east and from North Acton to Ruislip in the west. A special feature of the new lines would be the elimination of noise by the welding of the rail joints over lengths of 300 feet instead of lengths of 60 feet, as in the past. In addition the whole line would be asbestos sound-proofed.

Automatic Signalling in Switzerland

Automatic multiple-aspect signalling, using single rail d.c. track circuiting in association with single-phase traction, between Zurich and Oerlikon

By E. Felber
Dipl.-Ing., Signal Superintendent, Swiss Federal Railways, Berne



Multiple-aspect signal and track-circuit inductors. Note white-tipped sleepers denoting signalling rail

THE section between Zurich Central Station and Oerlikon is the busiest piece of double track on the whole Swiss Federal system, carrying 200 trains daily. In addition to a very heavy passenger traffic from the eastern districts of Switzerland, there is a heavy freight traffic, although there are routes which enable Zurich to be avoided. Since the opening of the Wipkingen Station there has been a growing residential traffic, and consequent difficulty in dealing with delays occurring on the section. Plans have been discussed more than once for building a second viaduct and independent access to the main goods yard, from a junction at Wipkingen, or a tunnel from Seebach through the Käferberg, but as there was little chance of either project materialising for a considerable time, some other means of meeting the urgent demand for increasing line capacity had to be found. It was accordingly decided to increase the number of block sections, and to replace the existing lock-and-block system by automatic signalling with track circuit control.

There are now five instead of three block sections, beginning at the signal bridge of No. 4 signal box at Zurich, and ending at the home signal for Oerlikon Station; and similarly in the opposite direction, each section being approximately 800 m. (875 yd.) long. The usual practice on the Swiss Federal lines is to use separate stop and distant signals, as this fits in excellently with the methods used for signalling the stations, but with sections as short as these an undesirable multiplication of signals would have resulted. The multiple-aspect principle was therefore adopted for the automatic signals, the aspects being as follow:—

1 red light—Stop; 2 yellow lights, horizontally—Caution, next signal at "stop"; 1 green light—Proceed, next signal is "off."

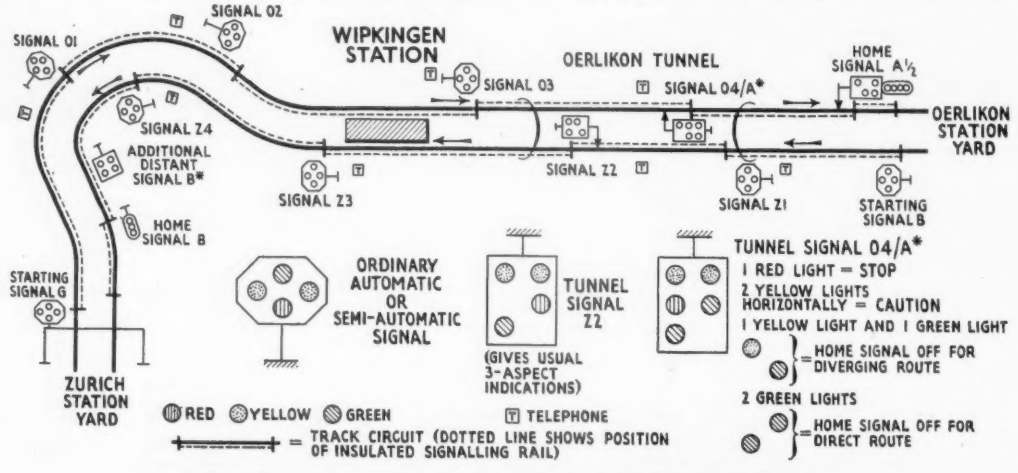
The red lens unit contains a second, or reserve, lamp, normally burning under voltage through a resistance, but brought up to normal intensity should the ordinary lamp fail.

The accompanying diagram shows the general layout of the installation. The signals marked O_1 to O_3 and Z_1 to Z_3 are normally clear. The overlaps are about 40 m. (131 ft.) long. Each signal is proved in the 'on" condition (red light properly exhibited) before the one in rear can clear a second time. The stationmaster at Wipkingen can hold either signal O_3 or signal Z_3 at "stop" in case of need by a hand switch.

Luminous Repeaters

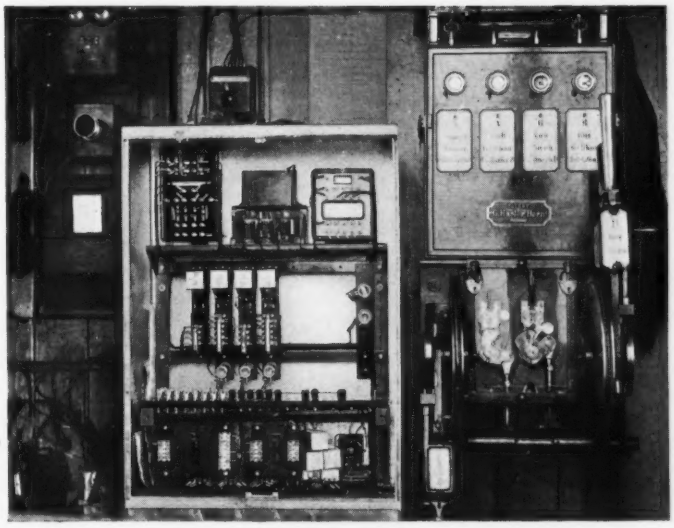
Luminous repeaters are provided for these signals under the platform awning. Lack of space necessitated the fixing of signals O_1, O_2, and Z_4 on the traction contact wire standards. Signal O_4 serves as a distant signal to the home signal at Oerlikon, $A\frac{1}{2}$, which itself, together with the distant for the starting signal, has been converted to colour-light working. A similar arrangement is adopted for the other direction of traffic at the approach to the Zurich home signal, but in this case, owing to the sharp curvature restricting the view, a separate distant signal marked B* is provided ahead of automatic signal Z_4.

The trains being operated on the single-phase, 15,000 volt, $16\frac{2}{3}$ cycle system, d.c. at 12 volts from batteries is used for the track circuits, which are of the single rail type, using neutral-polar relays, the control over the "caution" and "proceed" aspects of a signal being dependent on the polarity of the track feed at the signal in advance. Wooden sleepers are in use throughout the installation, but it is interesting to note that in view of the wide use made of steel sleepers in Switzerland, trials are again in progress to decide whether it will prove possible to insulate a rail effectively from the sleeper and so enable track circuiting to be used with the steel pattern. The track relays are protected against extraneous a.c. by impedance coils. The insulated and the



Signalling diagram, Zurich to Oerlikon, Swiss Federal Railways

Multiple-aspect signal and apparatus case



Apparatus case at Wipkingen Station, with old lock-and-block apparatus alongside on right

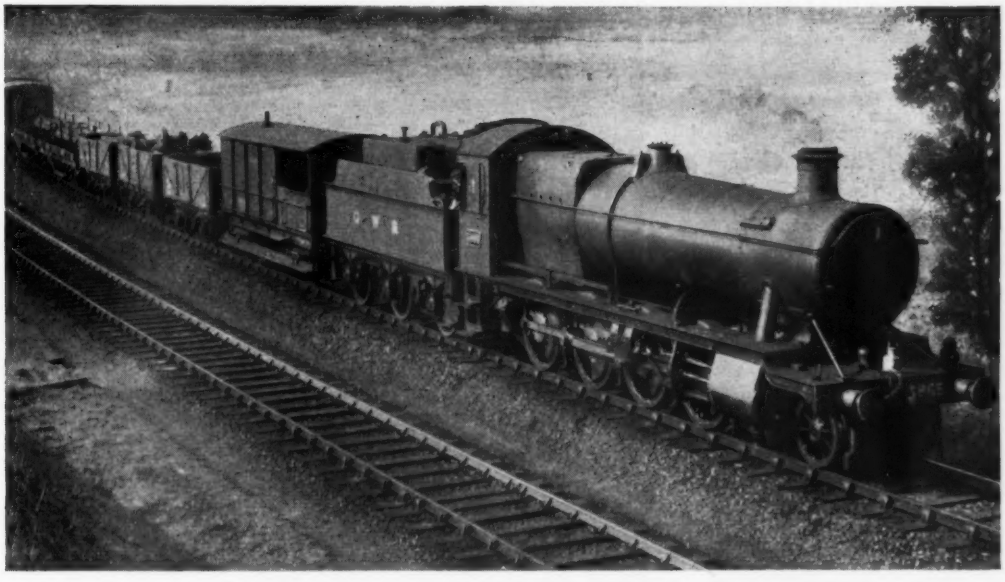
earthed (traction return) rails change positions at each track circuit division point, and to enable the train crews to distinguish them, the ends of the sleepers adjacent to the insulated (signalling) rail are painted white. This is necessary to prevent the contact wire being connected to the wrong rail when using the emergency earthing device. Special fuse arrangements are inserted between the two rails as a protection against any false and accidental high voltage connection, which might be serious for the maintenance staff.

As already mentioned, the intermediate signals all normally work automatically, but those serving as starting signals at Wipkingen Station can be held at "danger" by a stationmaster's switch if necessary, and are thus really semi-automatic. Illuminated diagrams are provided in the Zurich (leading) signal box No. 1; at the station block apparatus at Oerlikon—which controls the working of the station area in accordance with Swiss principles—and at the subsidiary No. 1 box at that station. Telephones are placed at each signal, and should a train be held there for 5 min. the crew must communicate with the proper official at the next station, give the train number and the designation of the signal, and ask for instructions.

The installation was brought into operation with the new 1941 timetable and has worked ever since without failure or incident of any kind. The best headway formerly obtainable was 4 min. for trains from and 6 min. for trains to Zurich; a 2 min. headway in both directions is now possible, and this has greatly improved the working of the morning and evening traffic, especially when late running occurs.

This installation, the first of its kind in Switzerland and generally similar to work of the same class on heavily-worked city lines elsewhere, was designed and installed by the Integra A.G., of Wallisellen, near Zurich, in association with the signalling staff of the Swiss Federal Railways.

G.W.R. Oil-Burning Class "2800" Locomotive



No. 3865, one of the 2-8-0 tender engines of the G.W.R. "2800" class which have been converted to oil burning, on an up freight train near Cardiff. An illustrated article dealing with the conversion of these locomotives was published in our January 18 issue

Photo.] *[J. G. Hubback*

Geared Steam-Turbine Locomotive, Pennsylvania RR.

The forward turbine drives through double reduction gears and quills on two axles, and develops 6,900 h.p.

THE first non-condensing steam turbine locomotive to be produced in the United States has recently been placed in service on the Pennsylvania Railroad. It was constructed by the joint efforts of two firms—the locomotive being built at the Eddystone Plant of the Baldwin Locomotive Works, and the turbines and gears manufactured by the Westinghouse Electric & Manufacturing Company.

The purpose of this venture was to test the principle of turbine propulsion in practical operation, and to determine its adaptability in opening the way to higher speeds and greater operating efficiency for the steam locomotive.

Work upon this design was begun in 1941, and was originally projected for a 6,900-shaft-horse-power locomotive for high-speed freight or passenger service, this being considered the highest practicable power for a rigid-frame eight-coupled driving unit. Wartime shortages of certain materials necessitated the substitution of six-wheeled bogies for the four-wheeled types originally planned, so the wheel arrangement became 6-8-6. The locomotive was ready for service in September, 1944; it is numbered 6200 and its classification lettering is S-2 on the Pennsylvania Railroad.

The main frame of the locomotive is a cast steel bed with boiler saddle, cross-stays, brake hanger brackets, and other details cast integrally with it. The leading bogie has a cast steel frame and outside Timken roller bearings on each axle; the trailing bogie is a six-wheeled "Delta" truck with cast steel frame, also with outside Timken roller bearings for each axle. Rolled steel wheels are used for each of these bogies. All four driving axles are fitted with Timken roller bearings; the 68-in. driving wheels are of cast steel with spoke type centres. All have flanged tyres, and are connected by coupling rods with Timken roller bearings at the crankpins.

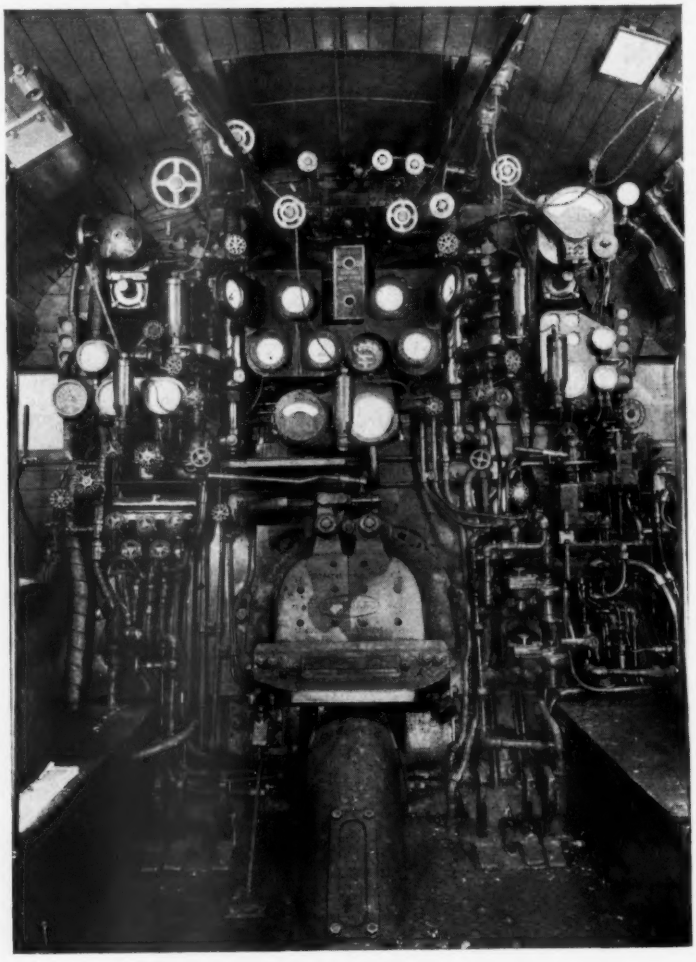
Westinghouse-American combined automatic and straight-air brake equipment is provided, having clasp brakes on all driving and carrying wheels, both on engine and tender.

The boiler is of the modified Belpaire type 93 in. dia. outside the first course, designed for a working pressure of 310 lb. per sq. in. It is equipped with a type "E" single-loop superheater, a feed-water heater, and a mechanical stoker. The firebox has six circulators supporting a firebrick arch. The combustion chamber extends 10 ft. into the boiler barrel.

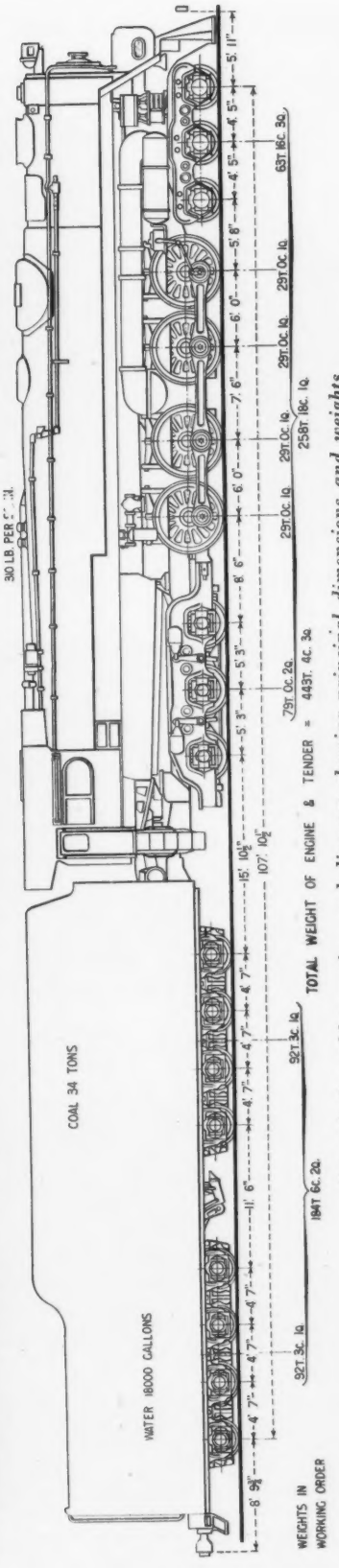
The tender, having a capacity for 18,000 U.S. gallons of water and 75,000 lb. (37½ short tons) of bituminous coal, is built up on a cast-steel water-bottom frame and is carried on two eight-wheeled bogies of standard Pennsylvania design.

Propulsion Unit

The propulsion equipment comprises a forward turbine, a double-reduction gear for each of the two middle driving wheels, a flexible cap drive element between the final gear and the two middle driving axles, and a reverse turbine and gear unit "clutched" to the high-speed pinion. Both turbine units are supported from the gear case, which in turn is supported from the main locomotive frame, making the power unit a complete assembly in itself. The three-point support of the gear unit is so designed that any distortion of the locomotive frame is not transmitted to the gear case. The forward turbine, of the impulse type, consists of a Curtis



The cab of the Baldwin-Westinghouse geared-turbine locomotive



General view of locomotive, and diagram showing principal dimensions and weights

stage followed by five full-admission Rateau stages. At 100 m.p.h. the turbine rotates at about 9,000 r.p.m. It is connected to the high-speed pinion at the reverse-turbine side of the unit, a quill shaft extending through the pinion.

Steam enters the turbine through four 3-in. pipes, each connected to a nozzle group covering about 25 per cent. of the Curtis stage blading. Each inlet pipe is connected to a throttle valve and header at the top of the smokebox, and the steam flow into each pipe is controlled by cam-operated valves, arranged to open in sequence.

The reverse turbine is a single Curtis stage, overhung on an extension of the reverse-gear pinion shaft. Steam is admitted through a single inlet pipe, also cam-operated. The maximum speed in reverse is 22 m.p.h., when the turbine develops 1,500 h.p. at about 8,300 r.p.m. The maximum starting tractive force in reverse is 65,000 lb., or 25 per cent. of the adhesive weight. This high figure—in view of the small size of the reverse turbine—is achieved by the addition of the reverse gear which quadruples the reverse turbine torque at the high-speed pinion. Power in reverse is transmitted to the main-gear high-speed pinion through a hydraulically-actuated clutch. Engagement or disengagement of the clutch when the locomotive is moving is prevented by a "zero speed" interlock in the pneumatic control circuit. The ahead turbine is never disengaged and must therefore rotate in the "wrong" direction when the locomotive is moving in reverse.

Single Lever Control

A single lever at the right-hand side of the cab is used to control the speed of the locomotive, also its direction (*i.e.*, forwards or backwards). The complete motion of the lever is the same as that in changing speeds from low gear to intermediate in a motor car. The "neutral" position of the automobile gear is the "off" position for the locomotive.

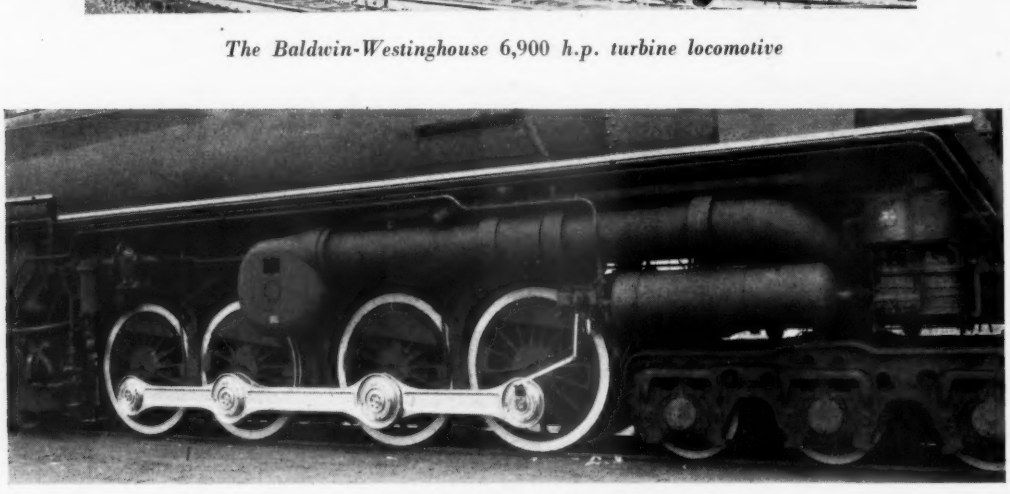
A pneumatic cylinder controlled by an air relay actuates the control gear for forward running; another is provided for movement in reverse. There is also a low-oil-pressure protection valve. If either turbine overspeeds (110 m.p.h. forwards, 25 m.p.h. in reverse), or if lubricating oil pressure falls below 5 lb. per sq. in., the protection valve operates to close either throttle by exhausting the control air to atmosphere. This control was supplied by the Westinghouse Air Brake Company.

Gearing

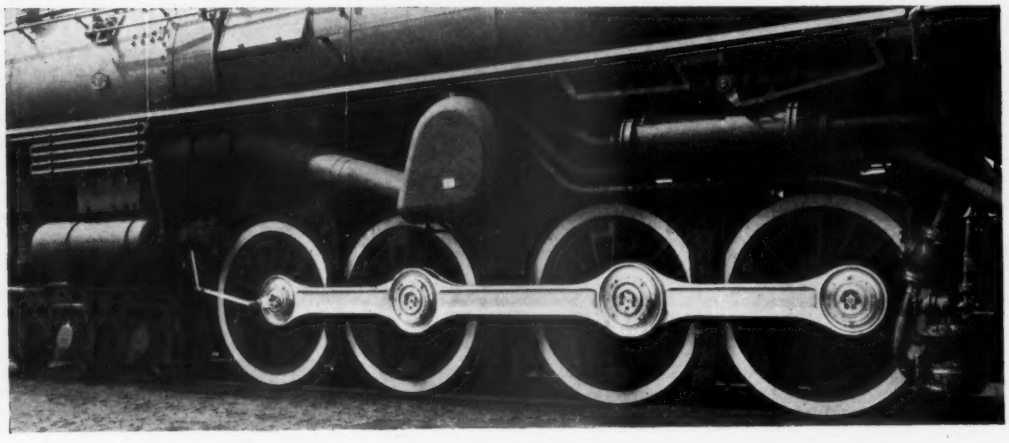
The main gear is a double-reduction unit designed to transmit power to the second and third driving axles. There are two double-helical high-speed gears, two low-speed spur pinions, two low-speed spur gears, and two cup-drive elements all housed in an enclosed fabricated steel gear case. The high-speed pinion and second reduction gearing is hardened and ground; this is the first commercial application of hardened and ground double-helical gearing. The tooth loading and the contact hardness (450 Brinell) of the high-speed pinion are more than twice the values commonly used. A special method, marking a major technical advance in gear-grinding, was developed for the production of the double-helical gears. The gear case is in four sections. The centre is the chief structural member to which the forward turbine and the reverse turbine and gear assembly are bolted; the upper section forms a cover and also adds to the crosswise stiffness; the two lower

Geared Steam-Turbine Locomotive, Pennsylvania Railroad

The Baldwin-Westinghouse 6,900 h.p. turbine locomotive



Right-hand side of locomotive with main forward turbine



Left-hand side of locomotive with auxiliary reversing turbine

sections (removable to permit dropping the axles) are lubricating-oil sumps.

Since the complete propulsion unit is supported from the spring-borne locomotive frame, the second and third driving axles must be permitted to move up and down with respect to the low-speed gears which surround them, as the locomotive moves over the rails. Moreover, this vertical movement of each driven axle must take place while it is turned by its gear. The cup drive which permits this motion is really a "misalignment coupling" between the low-speed gear and the axle. Although there is little physical resemblance, the principle is the same as the arrangement used on many electric locomotives. In addition to allowing up-and-down movements, these cup drives are torsionally flexible; this protects the gearing from shock loads.

Lubrication

All portions of the propulsion equipment are lubricated from a common source. The oil is pumped from the gear case sump by a centrifugal pump through a magnetic strainer and filter to an oil cooler of the surface type, cooled by boiler feed water. The oil then passes to a distributing manifold equipped with a steam-heating coil before being piped to the bearings and gear sprays. High-grade turbine oil is used, having a viscosity of 500 sec. Saybolt at 100° F. The system contains about 150 gal. A regulator maintains the oil pressure constant at 15 lb. per sq. in. on bearings and sprays.

Due to its turbine drive, the locomotive has uniform torque at all speeds, similar to that of electric and diesel-electric locomotives. The tractive power of the turbine locomotive exerted at the rail exceeds at practically all speeds that of a conventional steam locomotive having equal boiler capacity and adhesive weight. It also exceeds the tractive force of a 6,000-h.p. diesel-electric locomotive at speeds above 40 m.p.h., with a considerable advantage at speeds above 50 m.p.h.

At speeds above 30 m.p.h. the steam consumption of the turbine locomotive per horsepower at the rail is considerably less than that of a comparable reciprocating steam locomotive. At starting and at very low speeds the steam consumption of the turbine is relatively high, but with modern high-speed main-line schedules, with few stops and very little operation at low speeds, this is held to be more than offset by the advantages of the turbine at high speeds. The new locomotive has been undergoing tests on the Pennsylvania Railroad in both passenger and freight service. Continued operation in revenue-producing service is contemplated, to prove fully the mechanical adequacy of the design.

We append herewith the leading dimensions of this locomotive. For information contained in this article we are indebted to Mr. R. P. Johnson, Chief Engineer of the Baldwin Locomotive Works, and to our contemporary *Railway Mechanical Engineer*, for details given in its March, 1945, issue by Mr. Newton and Mr. Brecht, of the Westinghouse Electric & Manufacturing Company.

LEADING DIMENSIONS

Coupled wheels, dia.	68 in.
Boiler pressure, per sq. in.	310 lb.
,, dia. largest (outside)	102 in.
Firebox, length	180 in.
,, width	96 in.
Combustion chamber length	120 in.
Net gas area through tubes	11 sq. ft.
Length over tube plates	18 ft.
Grate area	120 sq. ft.
Evaporative heating surfaces—	
Tubes (49, 2¼ in. dia.; and 235, 3½ in. dia)	4,378 sq. ft.
Circulators	84 sq. ft.
Firebox and comb. chamber	530 sq. ft.
Total	4,992 sq. ft.
Superheating surface	2,050 sq. ft.
Combined total	7,042 sq. ft.
Tractive effort, forward	70,500 lb.
,, ,, reverse	65, 000 lb.
Adhesion weight	260,000 lb.
Weight of engine in working order	580,000 lb.
Water capacity of tender	18,000 gal.
Fuel capacity of tender	75,000 lb.
Weight of tender	412,900 lb.
Total weight of engine and tender	992,900 lb.
Wheelbase, driving	19 ft. 6 in.
,, bogies	13 ft. 6 in.
,, engine, total	53 ft. 0 in.
,, engine and tender, total	108 ft. 0 in.

TURBINE CHARACTERISTICS

Steam conditions—	
Pressure at turbine inlet	285 lb. per sq. in.
Steam temperature at inlet	750° F.
Back pressure at turbine exhaust	15 lb. per sq. in.
Ahead turbine—	
Nominal rated capacity	6,900 h.p.
Maximum turbine operating speed	9,000 r.p.m.
Overspeed governor controlling speed	10,000 r.p.m.
Reverse turbine—	
Nominal rated capacity	1,500 h.p.
Maximum turbine operating speed	8,300 r.p.m.
Overspeed governor controlling speed	9,100 r.p.m.
Main reduction gear—	
High-speed ratio	31 : 160
Low-speed ratio	31 : 111
Total reduction	18·5 : 1

The "Royal Scot" in the Lune Valley

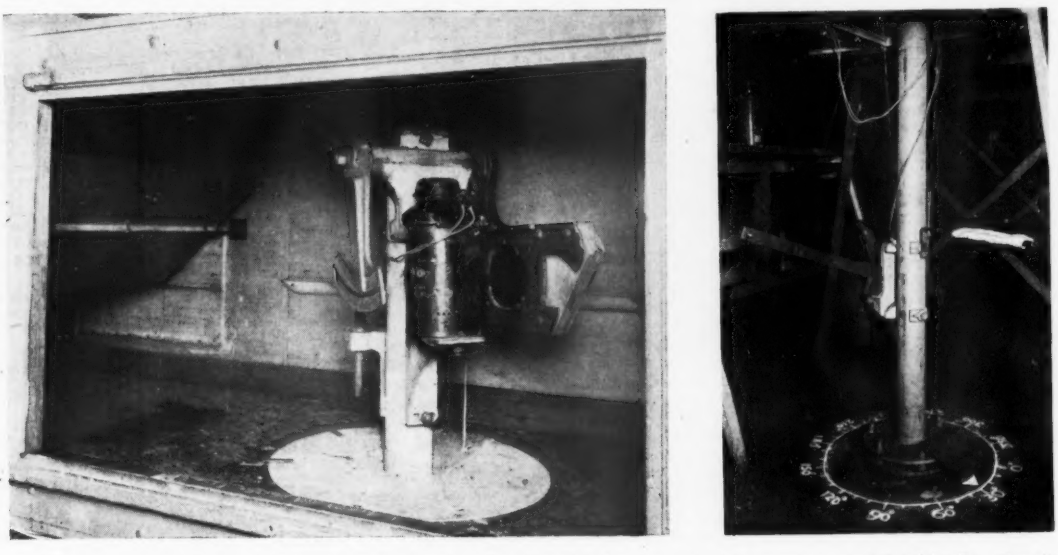
Southbound L.M.S.R. "Royal Scot," in the Lune Valley, near Tebay. The locomotive, 4-6-0 No. 6137, is "The Prince of Wales Volunteers (South Lancs.)" "Royal Scot" class as originally built

L.M.S.R. Signal Lamp Tests in Wind Tunnel

Ascertaining the ability of oil lamps to remain alight in varying wind conditions

TESTS have recently been carried out in the L.M.S.R. wind tunnel, at Derby, on behalf of the Signal & Telegraphic Engineer, so that information might be available to assist in perfecting the design of an oil lamp for signals that will stand up to the very worst conditions of vibration and adverse weather. The lamps are a vital item in signalling equipment. They burn for a week at one filling of oil, without intermediate attention, so great care is needed in protecting the flame from wind.

For the purpose of the tests, a standard semaphore signal was employed, the upper portion projecting into the wind tunnel and the base being pivoted to enable the signal to be rotated to produce the effect of wind from any direction. A flap was arranged in the tunnel so that the effect of a sudden gust of wind could also be produced. The rotatable base for the signal post was fitted with a pointer moving round a scale calibrated in degrees, so that the conditions of wind blowing from any direction could be simulated with accuracy.



The lamp inside the wind tunnel (left), showing the pivoted flap to simulate gusts; and (right) the signal post on rotatable mounting with direction indicator

The "Golden Arrow" Express, Southern Railway

The "Golden Arrow" express, Southern Railway, leaving Victoria Station hauled by "Merchant Navy" class Pacific No. 21C1, "Channel Packet"

RAILWAY NEWS SECTION

PERSONAL

Mr. J. C. Carr, Principal Assistant Secretary, Ministry of Supply, has been appointed Acting Controller of Iron & Steel, pending the setting up of the proposed new control board. Mr. C. R. Wheeler, as recorded in our May 17 issue, has relinquished his appointment as Controller, in accordance with arrangements previously agreed by the Ministry to enable him to return to his company.

We regret to record the deaths of:—

Mr. William Bishop, on May 19, in his 83rd year, Chief Solicitor, Southern Railway Company, from 1923 until his retirement in 1937, before which he had been Solicitor, London & South Western Railway Company, from 1910.

Mr. Frank Bushrod, O.B.E., on May 24, aged 71, Superintendent of Operation, Southern Railway, from 1930 until his retirement in 1936.

Mr. William Embry Bradbury, M.B.E., on May 23, in his 88th year, Assistant to the Chief General Superintendent (Naval & Military), L.M.S.R., from January 1, 1923, until his retirement in April, 1924. Mr. Bradbury's son, Mr. W. P. Bradbury, is the present Chief Commercial Manager of the company.

Mr. W. P. N. Edwards, Director of the Overseas Information Division, Board of Trade, has been appointed Counsellor at the British Embassy in Washington, in charge of the British Information Services in the United States, in succession to Mr. Harold Butler, who has retired. Mr. Edwards was formerly Joint Public Relations Officer, London Passenger Transport Board.

The late Mr. F. Samuelson, who was for many years Chief Turbine Engineer, and latterly a Director, of the British Thomson-Houston Co. Ltd., left £40,661.

Mr. R. Patterson, District Superintendent, Broken Hill, Rhodesia Railways, has been appointed District Superintendent, Beira, in succession to Mr. L. H. Barrow, who has retired.

INDIAN RAILWAY STAFF CHANGES

Mr. R. O. C. Thomson, Officiating Controller of Stores, N.W.R., has been granted leave out of India for six months as from April 1.

Mr. C. R. Grey has been appointed to officiate as Controller of Stores, N.W.R.

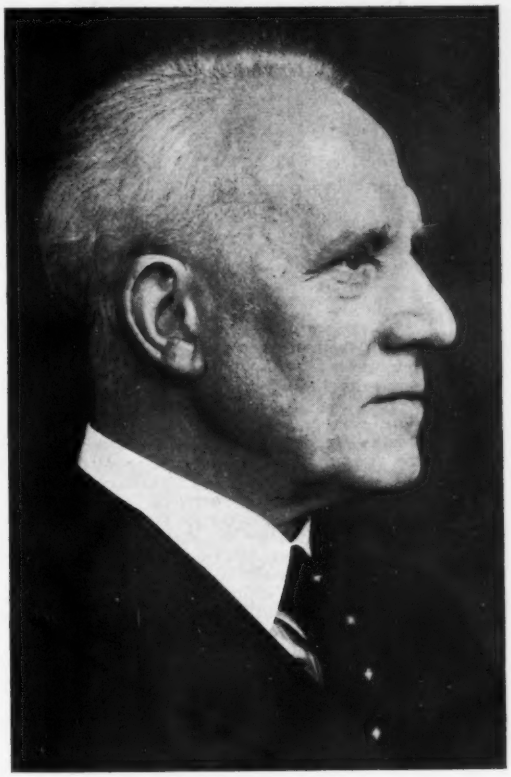
SOUTH AFRICAN RAILWAYS & HARBOURS

Mr. P. L. Blignaut, Signal Engineer, has been appointed Assistant Chief Signal Engineer, Chief Civil Engineer's Office, Johannesburg.

Mr. C. N. L. Bowen, Superintendent (Financial), has been appointed Chief Superintendent (Financial).

Mr. G. W. Smith, Chief Clerk, General Manager's Office, has been appointed Superintendent (Financial), General Manager's Office, Johannesburg.

Mr. A. W. Norman, Assistant Chief Stores Superintendent, London Midland & Scottish Railway, who, as recorded in our May 10 issue, has been appointed Chief Stores Superintendent, commenced his career with the London & North Western Railway in the Goods Agent's Office, Broad Street, and, after four years in various sections, was transferred to the London District Goods Manager's staff. He took an active part in the London District Railway Debating Society, and was a student at the London School of Economics, gaining a "first" in both Railway Operating and Railway Law. In 1910 he was transferred to the then newly-formed Buying Section of the General Manager's Office, and organised (under the supervision of the late Mr. S. H. Hunt) the purchasing arrangements for the company's hotels and refreshment rooms. Mr. Norman was appointed Head of the Section dealing with iron and steel, non-ferrous metals and other materials, in 1915, and in 1919 became Assistant in the Buying Section of the General Manager's Office. In 1922 he was transferred to the office of the Divisional Stores Superintendent, during which time he conducted a special investigation (on behalf of the General Manager) into the realisation of excess and obsolete stores. In 1928 he spent some months in America and Canada in connection with a special inquiry on behalf of the President. In June, 1929, he was appointed Assistant to the Chief Stores Superintendent, and in July, 1933, Assistant Chief Stores Superintendent. He has served under five successive Superintendents since the L.M.S.R. group was formed. Mr. Norman has recently been appointed Chairman of the R.E.C. Stores Committee. He is a Freeman of the City of London, and his grandfather was admitted a Freeman exactly 100 years ago.



Mr. A. W. Norman

Appointed Chief Stores Superintendent, L.M.S.R.

We regret to record the death on February 28, at the age of 76, of Mr. A. H. Wallis, who was System Manager, Pretoria, South African Railways & Harbours, 1928-29.

We regret to record the death on May 21 of Lady Watson, wife of Sir Arthur Watson, who was General Manager of the L.M.S.R., 1923-24, and General Manager, Buenos Ayres & Pacific Railway, 1926-28.

We regret to record the death, on May 8, in his 66th year, of Mr. E. P. Flintoft, K.C., who retired last year from the position of Vice-President & General Counsel, Canadian Pacific Railway.

SOUTHERN RAILWAY LONDON STATIONMASTERS

Mr. E. Card, Stationmaster, London Bridge, retires on July 1, and Mr. F. Bassett, Stationmaster, Charing Cross, succeeds him. Mr. W. G. K. Doorne, Yardmaster, Battersea, has been appointed Stationmaster, Charing Cross.

We regret to record the death on April 25, aged 71, of Mr. William Carter Dickerman, Chairman of the American Locomotive Company from 1940 until his retirement last December.

The King has awarded the Imperial Service Medal to 15 employees of the Department of Railways, and 5 employees of the Department of Road Transport & Tramways, New South Wales.

On May 23, Mr. J. L. Harrington (General Assistant to General Manager), Mr. S. A. Fitch (Assistant Superintendent of Operation), Mr. S. B. Warder (New Works Assistant to Chief Electrical Engineer) and Mr. M. S. Hatchell (Assistant to Chief Mechanical Engineer), Southern Railway, sailed for America in the *Queen Mary* to study American and Canadian progress and development in dealing with diesel electric traction. The party expects to be away for about four weeks.

Mr. P. R. Hickman, who, as recorded in our May 10 issue, has been appointed Assistant Chief Stores Superintendent, L.M.S.R., commenced his career in the Midland Railway Stores Department at Derby in 1905. In 1926 he was transferred to Euston and appointed Assistant (Stores Inspection) to the first Chief Stores Superintendent. In 1930 he became General Assistant. From 1943-45 his services were lent to the Ministry of War Transport, to act as Chief Superintendent of Sea Transport Stores. In that capacity he made several visits abroad, including the U.S.A., Canada, India, Ceylon, South Africa, Mediterranean area and North-West

Mr. P. R. Hickman

Appointed Assistant Chief Stores Superintendent, L.M.S.R.

Lafayette *[Glasgow*

Mr. J. Killin

Appointed District Goods & Passenger Manager, Motherwell, L.M.S.R.

Mr. J. D. York

Assistant Chief Mechanical Engineer, Sudan Railways, 1942-45

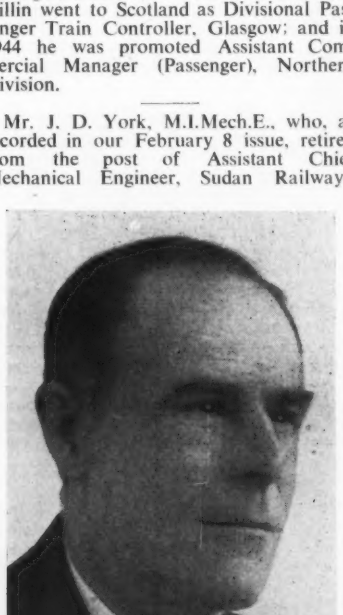
Europe. He resumed with the L.M.S.R. in January, 1946, as General Assistant, which position he now vacates on his new appointment.

Mr. J. Killin, who, as recorded in our April 12 issue, has been appointed District Goods & Passenger Manager, Motherwell, L.M.S.R., served in the Royal Engineers during the war of 1914-18, and on demobilisation in 1919 joined the Midland Railway. After occupying various positions he became Development Assistant (Signalling) to the Chief Operating Manager, London, in 1937. In 1939 Mr. Killin went to Scotland as Divisional Passenger Train Controller, Glasgow; and in 1944 he was promoted Assistant Commercial Manager (Passenger), Northern Division.

Mr. J. D. York, M.I.Mech.E., who, as recorded in our February 8 issue, retired from the post of Assistant Chief Mechanical Engineer, Sudan Railways, last November, is now serving in Germany with the British Army of Occupation. Mr. York was born in 1895 and received his locomotive training with the Great Northern Railway at Doncaster as a premium apprentice. During the war of 1914-18 he first served with the Queens Own Yorkshire Dragoons and went to France in 1915. In 1916 he transferred to the Nottinghamshire Sherwood Rangers Yeomanry and saw service in Salonika and Palestine. In 1917 he was seconded to the Railway Operating Division in Palestine, and became Locomotive Running Superintendent of the captured Turkish Railway. He was mentioned in despatches. After demobilisation he joined the Palestine Government and was Assistant Locomotive Running Superintendent & Works Manager. Mr. York joined the Sudan Railways in 1924 as District Locomotive Superintendent. He was promoted Locomotive Running Superintendent in 1933, and in 1942 was appointed Assistant Chief Mechanical Engineer. He was intimately associated with the conversion of the mainline locomotives from coal to oil burning, and has always taken a great interest in that subject.

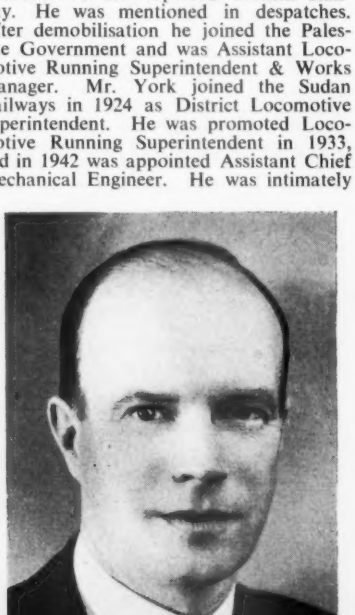
Mr. Arthur Gordon Snell, Assistant Divisional Locomotive Superintendent, Wolverhampton, Great Western Railway, who, as recorded in our April 5 issue, has been appointed Divisional Locomotive Superintendent, Oswestry, entered the company's service as an apprentice at Swindon in 1915, and served for a period as a draughtsman in the drawing office there. In 1924 he became Inspector in the Cardiff Valleys Division, and in 1927 was appointed Assistant to the Divisional Locomotive Superintendent, Worcester. Twelve years later he received the appointment which he now vacates.

Mr. W. R. Stevens, A.M.Inst.T., Assistant Divisional Superintendent, Newport, Great Western Railway, who, as recorded in our May 10 issue, has been appointed



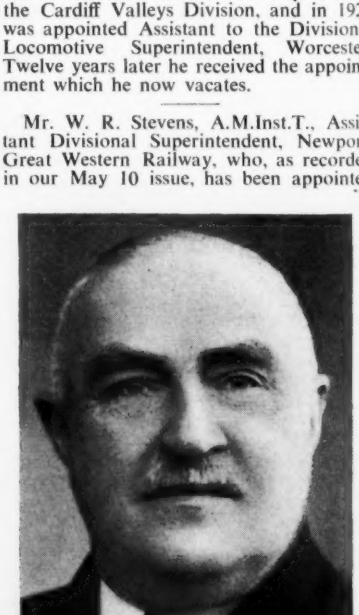
Mr. A. G. Snell

Appointed Divisional Locomotive Superintendent, Oswestry, G.W.R.



Mr. W. R. Stevens

Appointed Divisional Superintendent, Newport, G.W.R.



Mr. P. G. Robinson

Assistant Manager, G.W.R. Hotels & Catering Department, who has retired

Divisional Superintendent, Newport, was educated at Clifton College. He joined the G.W.R. in the General Manager's Office, Paddington, in December, 1919, and was transferred to the Office of the Superintendent of the Line, Paddington, in 1932. He was appointed Junior Assistant to the Divisional Superintendent, Paddington, in 1933, and Chief Clerk to the Divisional Superintendent, Gloucester, in 1935. Mr. Stevens became Assistant Divisional Superintendent, Newport, in January, 1939.

Mr. P. G. Robinson, M.B.E., who, as recorded in our May 3 issue, has retired from the position of Assistant Manager, Great Western Railway Hotels & Catering Department, entered the company's service in 1897. After serving in various departments he joined the Hotels & Catering Department, of which for the last 20 years he has been Assistant Manager. He has been closely associated with the development of the company's hotels, including being largely responsible for the enlargement and re-furnishing of the Tregenna Castle Hotel, St. Ives, and being responsible for the detail work in connection with the conversion of the Manor House at Moretonhampstead, Devonshire, from a private house into an hotel; and he has played a large part in the modernisation of the G.W.R. refreshment rooms at Bristol, Newport, Cardiff, Swansea, Leamington, Exeter and other stations. During the time he has been Assistant Manager, the first snack bar has been introduced at Paddington, and the first buffet car on the G.W.R. system. He was responsible for catering arrangements on the dining cars, and during peak holiday periods of peacetime had had to provide food and drink for nearly 100 cars a day in all parts of the system. One of his duties also has been catering on royal and special trains. In the war of 1914-18 Mr. Robinson served as a Captain attached to the Royal Engineers. He was mentioned in dispatches and made an M.B.E. (Military).

INSTITUTION OF LOCOMOTIVE ENGINEERS

The Council of the Institution of Locomotive Engineers for the year commencing June 1 is composed as follows:—

President: Mr. F. S. Whalley (Vice-Chairman & Managing Director, Vulcan Foundry Limited; President, Locomotive Manufacturers' Association).

Vice-Presidents: Messrs. W. G. Hornett (Railway Consultant, Sentinel (Shrewsbury) Limited); J. S. Tritton (Partner, and Head of Locomotive Department, Rendel, Palmer & Tritton); H. Holcroft (formerly Technical Assistant, Locomotives, Chief Mechanical Engineer's Office, Southern Railway; Editor, *Railway Engineering Abstracts*); W. S. Edwards (Managing Director, W. G. Bagnall Limited); W. Cyril Williams (Director, Beyer, Peacock & Co. Ltd.).

Ordinary Members of Council: Messrs. R. C. Bond (Mechanical Engineer, Locomotive Works, L.M.S.R.); W. H. W. Maass (Assistant Advisory Engineer to South African Railways & Harbours, and to Office of High Commissioner for South Africa, London); Brigadier Sir Bruce G. White (Wolfe Barry & Partners); Messrs. E. S. Cox (Chief Technical Assistant, Chief Mechanical Engineer's Department, L.M.S.R.); J. Rankin (Locomotive Works Superintendent, Crewe, L.M.S.R.); A. Campbell (Deputy Chief Engineer, Crown Agents for the Colonies); H. W. H. Richards (Chief Electrical Engineer, L.N.E.R.); E. C. Poultney; E. Graham (Mechanical Engineer, Railways, L.P.T.B.); R. J. Harvey (Consulting Engineer for New Zealand Government Railways, London); M. S. Hatchell (Assistant to Chief Mechanical Engineer, Southern Railway); W. F. McDermid (formerly Chief Draughtsman, Stratford, L.N.E.R.); E. A. Robinson (Managing Director, Superheater Co. Ltd.); Lt.-Colonel H. Rudgard (Superintendent of Motive Power, L.M.S.R.); Messrs. R. A. Smeddle (Mechanical Engineer, Darlington, L.N.E.R.); C. E. Spurgeon (Chief Inspecting Engineer, London, to Egyptian Government); J. F. B. Vidal (Engineer, J. Stone & Co. Ltd.); W. L. Watson (Chief Engineer, Contracts, Crown Agents for the Colonies).

FURTHER DELEGATIONS FROM PARIS AND STOCKHOLM VISIT L.P.T.B.

Two further delegations, from the Paris Metropolitan Railway, and from Stockholm Tramways, are visiting the London Passenger Transport Board. Eight engineers from the Paris Underground railway and Paris road services arrived in London on May 19, eight days after the first delegation, which had spent a week studying the organisation of the L.P.T.B., had returned to Paris. The new visitors are: M. Ruhlmann, Technical Manager; M. Gaston, Chief Engineer; M. Levy, Research Engineer (Rolling Stock); M. Douzon, Assistant Chief Engineer (Operation); M. Guignot, Chief Engineer (Technical Department); M. Aguzon, Chief Engineer (Road Services); M. Bancourt, Chief Engineer (Road Services Operation); and M. Albert, Chief Engineer (Trolleybuses). On May 22, Herr Erik Tengblad, General Superintendent, and Herr Nils Nilson, Superintendent, of Stockholm Tramways, arrived in the wake of a small delegation from that undertaking which came to study L.P.T.B. organisation in March. The new visitors have come to obtain information on staff training and fares compilation.

Staff & Labour Matters

Re-Instatement in Civil Employment: Appeal by Southern Railway

The Southern Railway successfully appealed to the Deputy-Umpire recently against the decision of the Camberwell Re-instatement Committee that the company should continue to employ a lifter named James Gilbert Dowson whom it had dismissed for disciplinary reasons. Dowson was re-instated by the company on December 3, 1945, subsequent to service in the Army since August 15, 1939, and was discharged by the company on January 19, 1946, on the contention that, by his persistent refusal to obey a reasonable order to work overtime, Dowson made it otherwise than reasonable and practicable for it to continue to employ him.

The re-instatement committee (Camberwell) held that it was reasonable and practicable for the company to continue to employ him; ordered the company to take him back into employment; and further ordered that the company pay to him £13 10s. as compensation for the loss suffered by him as a result of his discharge. The company appealed from the decision, alleging in effect that the order to work overtime was a reasonable order and that the applicant's persistent disobedience justified his dismissal.

The appeal was heard by the Deputy-Umpire, who states in his decision that the position, as appearing from all the evidence now available, was that the applicant, who was first interviewed by Mr. A. E. Roberts, Rolling Stock Engineer, Chief Electrical Engineer's Department, was told by him of the conditions under which he would be required to work—conditions under which all the workers of his shop, including ex-servicemen, were required to work overtime for a period of urgency due to shortage of staff and the volume of necessary repair work, from 5.30 to 7.30 p.m. On several occasions before dismissal Dowson was reminded of his obligation to work overtime but he had refused to do so. Further, he was provided, before he commenced work, with a booklet containing the rules applicable to his employment. By Rule 4 thereof it is provided that the company may dismiss an employee without notice for certain definite offences including "disobedience of orders" or "absence from duty without leave," and there is undisputed evidence that his attention was called to this provision and to his liability to be discharged if he persisted in his refusal to comply with the order. When, on or about December 30, he received a charge sheet and was given the opportunity of full investigation under a "disciplinary procedure" which had been in operation for 14 years, he refused or failed to make use of it, to give any answer to the charge, or to take any action. Further, although he is a member of the National Union of Railwaymen, he did not approach, or ask for the advice or help of, his union until after his discharge.

The Deputy-Umpire states that on full consideration he is of the opinion that, on the whole, the company's representatives in their treatment of Dowson were not, within their respective spheres of knowledge and authority, unmindful of the psychological effect of the long hardships and perils which he had endured and survived during his Army service; and the decision concludes by stating: "Since the re-instatement committee gave its decision, the company, pending the hearing of the appeal, has taken the applicant back into its employment without requiring him meanwhile to work overtime, although he expressed through his association his willingness to work overtime as from the beginning of April. I would add that the company has made it clear, whatever the result of its appeal, that it is ready and willing without penalty to employ him in the occupation of lifter in his old shop or 'in any shop he chooses,' provided that henceforward he is willing to work under the same conditions and disciplinary rules as are applicable to his fellow employees. In the result I am unable to agree with the re-instatement committee that the company, in taking the disciplinary action which it did in the circumstances aforesaid, was in default in the discharge of its obligations under the Act, and I agree with the contention that the applicant had by his conduct made it otherwise than reasonable and practicable for the company to continue to employ him at the time in question. I accordingly allow the appeal."

Ministry of War Transport Accident Report

At Browney Signal Box, L.N.E.R. : January 5, 1946

Colonel A. C. Trench, C.I.E., inquired into the accident which occurred at about 5.40 a.m. on January 5, 1946, at Browney signal box, between Ferryhill and Durham, L.N.E.R., when the 11.15 p.m. express, Kings Cross to Newcastle, composed of 15 bogie coaches, drawn by class "V2" 2-6-2 engine No. 4895, collided with the wreckage of an up goods train from Low Fell to Doncaster, composed of 44 4-wheel wagons and 20-ton brake, which had become divided, and the rear portion of which had overtaken the front portion.

Ten passengers were killed and 18 were taken to hospital. Seven others suffered minor injuries or shock, as did 4 of the 7 of the staff of the two trains. The collision between the two portions of the goods train must have taken place at fair speed. Its engine was derailed, just fouling the down track; the tender was thrown over, all wagons of the leading portion were derailed and thrown on their sides in varying degree; two were thrown partly down the embankment and caught in the signal wires. The majority of the remaining vehicles were derailed and considerably damaged.

The down express only just fouled the buffers of the goods engine, and might have escaped with minor damage, but ran into more extensive debris later on. Engine and tender were thrown on their sides and the leading brake van. The second, third, and fourth coaches were thrown in a heap and wrecked, with the fifth on top of them. The train was running at about 50 m.p.h. The night was dark but clear; the rail was wet.

The accompanying drawing, taken from Colonel Trench's report, shows the route concerned and the gradients. The goods train had traversed a steep rising gradient from Durham; the summit was about 100 yd. north of Relly Mill Junction box. The Browney down distant signal is very good for sighting by drivers, but overbridge 178, about 500 yd. from that box, is 108 ft. long and would seriously restrict visibility of the scene of the accident. There is a speed restriction of 50 m.p.h. immediately north of Croxdale Viaduct.

The goods train left Low Fell about 4.30 a.m. and proceeded, with a stop at Ouston, as far as Bridge House, where signals were against it and the driver saw a man standing in the 6 ft. way near the home signal. This was a relief signalman, who got on the footplate. The signal was cleared before the train stopped. The guard had not applied his handbrake, and the train had probably closed up on the failing gradient behind the engine and the two leading vans, which were vacuum fitted. The driver released his brake, but said he did not open the regulator until he thought the couplings were tight; there was no serious pluck and he had no suspicion that a breakaway had occurred. Travelling at about 25 m.p.h. he sighted the Browney signals against him. The home signal was cleared at the last moment and he stopped at the box in obedience to a red hand-signal. The relief signalman said he felt a jolt as he got on the footplate. Subsequently he said that he did not think the driver had opened his regulator at the moment of the jolt, and could not understand it, but he suspected a division.

The signalman at Bridge House saw a gap about 6 or 7 wagons back from the engine and sent "train divided" to Browney; he then telephoned to say the second portion was following. He tried then to attract the guard's attention, but the van had passed and it was too late to use the detonator placer. The guard was unaware of any division and his vehicles were running at about 25-30 m.p.h. down the gradient when they collided with the front portion.

As the goods engine stopped at Browney box the signalman shouted that the train was divided and asked the driver where the rear portion was; about that moment the side-lights of the van were seen approaching. The regulator was opened in an attempt to get away. The driver, who picked himself up immediately after the shock of the collision, saw the express approaching, but did not think of trying to warn it by whistling.

"Line clear" had been given for the express from Browney just before "train divided" was received from Bridge House. The signalman was under the impression that there was a rising gradient near Littleburn box, which might bring the second half of the goods train to a stand, and he did not want to run any risk of a derailment or collision on Croxdale Viaduct. He decided therefore to stop the leading portion of the goods train although he had obtained "line clear" for it. He told the fireman, who came into the box in accordance with the regulations when the engine stopped, that he had accepted the express. He telephoned to Hett Mill, but the signalman there did not answer for a moment—he was watching the approach of the down express—and said the train was divided. An endeavour was made to stop the express at Hett Mill, but too late. The results of the collision

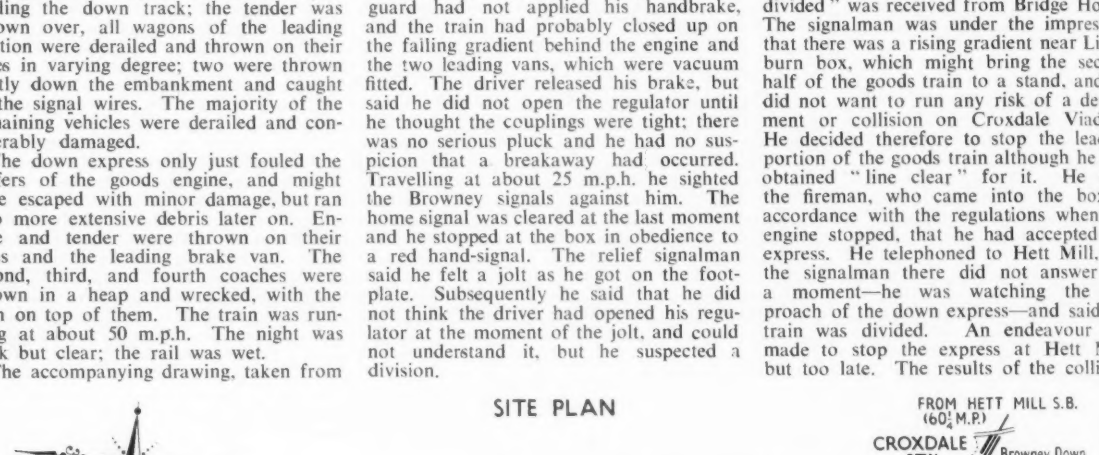


Diagram illustrating circumstances of accident at Browney signal box, L.N.E.R., January 5, 1946

prevented the fireman of the goods train from having time to do anything effective in the same direction.

Inspecting Officer's Conclusions

Colonel Trench finds that the signalman at Bridge House box failed to rise to the occasion in that he did not make every effort to warn the guard before telephoning to Browney box after sending "train divided." It seems an open question whether he could have stopped the goods engine by throwing on the starting signal (500 yd. ahead) with comparatively little risk of violent collision, but his inaction in this respect is not held to justify criticism. The signalman at Browney box, having got "line clear" for the train, should have allowed the leading portion to run forward, giving a green hand signal to it and sending on "train divided." Had he done this the second portion, with reasonable luck, might have been brought to a stand on the rising gradient beyond Croxdale. His reasons for departing from the rule appear to have been that he thought there was a length of rising gradient between Bridge House and his box; that he was anxious to avoid an accident on Croxdale Viaduct, and that he wanted any that did occur to do so within the protection of his down home signal.

While feeling that the third reason may have been an afterthought Colonel Trench believes him to have been seriously influenced by the other two and that he exercised a reasonable discretion in stopping the first portion of the train, for which he cannot be blamed. This, however, obviously increased the risk of collision between the two portions, and common sense should have dictated the assumption that this was imminent and the immediate sending of "obstruction danger" to Hett Mill. It is difficult to understand that a signalman of 16 years' experience should not have appreciated this. Even if he had deferred action until he saw the van lights and had then immediately sent "obstruction danger" there is no doubt that there would have been time to stop the express.

Had the signalman acted in strict conformity with the rules the Hett Mill signalman would have had ample time in which to stop the express in accordance with the action prescribed on receipt of "train divided," but this admittedly would have involved risk to the second portion while negotiating Croxdale Viaduct, probably at high speed. The assurance that the signals were never pulled off from the box is accepted. They were cleared irregularly by the derailed wagons.

The signalman—a relief man—had been working in Browney box for 5 weeks, and thought the 700 yd. section opposite Littleburn box to be on a rising gradient, whereas it falls at 1 in 3,300. Admittedly this length, between two fairly steep falling gradients, is deceptive to the eye, but it did not give Colonel Trench the impression of being able to stop a runaway goods train. He considers it part of the obvious duty of a signalman to acquaint himself in general terms with the physical conditions of the line on each side of his box when they may have a bearing on the operation of trains, either normally or in emergency.

Notwithstanding that much of the circumstance of this accident was actual misadventure, Colonel Trench considers that a considerable measure of responsibility for failing to take steps which would have stopped the express must rest on the signalman at Browney box. He is a man with a good record. No criticism is directed against the enginemen or the Hett Mill signalman,

The fractured drawbar was on L.M.S.R. (old L. & Y.) wagon No. 147330, built at the L. & Y. works at Newton Heath in 1914. The drawgear comprises a horizontal set of leaf springs extending right across the wagon at each end; the ends of the springs bear on the inner ends of the buffers while the centre of the springs is held in a buckle forming part of the through drawgear member. The result is that the springs are deflected and provide a cushion effect. The inner end of this type of drawbar is slotted for a vertical cotter which links it to the outer end of the plates forming the spring buckle mentioned above, these plates lying above and below the drawbar, so that the cotter is in double shear. In this particular drawbar the slot had not been located centrally. The difference in thickness of metal on each side of the slot was sufficient to be noticeable to the most cursory examination when the drawgear was dismantled, though it would not reasonably be noticed when in position.

Apart from the lateral displacement of the slot, the total area of solid metal in its sides is materially less than that specified on the standard L. & Y. drawing current on the date the wagon was built, the actual area being $1\frac{19}{32}$ sq. in. as against $2\frac{5}{32}$ sq. in. on the standard drawing, and a corresponding area of $1\frac{26}{32}$ sq. in. on the present R.C.H. minimum dimensions drawing of a drawbar of more modern design and higher tensile steel. This lack of cross-sectional area was not due to wear.

There was a similar deficiency of metal as compared with the standard drawing, at other points along the shank, so much so that it seems questionable whether the drawbar was not manufactured in accordance with some earlier and lighter design. It was clear from the fracture that the thin side of the slot had parted first, after which the end portion had been bent back and later the thicker side also parted (see sketch); both breaks were new.

Metallurgical examination at the point of fracture indicated no defect in chemical composition or in the metallic structure, and a tensile strength of 25.6 tons per sq. in., which, though much below present standard specification (32-38 tons) cannot be regarded as abnormally low. From the manner in which the broken end was confined, vertically between the plates of the spring buckle and horizontally by the rivet holding these plates together, which is located immediately in rear of the broken end, it seems possible that, after the initial fracture of the thinner side of the slot, the half broken end was held by the rivet in rear, the whole of the strain being taken by the unbroken (thicker) side of the slot, until this also parted. The initial fracture cannot have occurred long before the final fracture in view of the condition of the surfaces of the initial break.

The drawbar was of inadequate total cross-sectional area and the weakness due to this deficiency of area was accentuated by the faulty location of the slot. The drawbar should not have been passed for use when originally made and should have been discarded as below standard on any of its periodical general overhauls, of which the latest was in 1941. In connection with this last inspection, however, it should not be forgotten that the general shortage of steel was so acute at that time that instructions had been issued to make every effort to economise.

Apart from the inadequate dimensions and faulty manufacture of the drawbar it would appear that this design, with a flat cotter about $1\frac{1}{4}$ in. in width to form the connection, in place of the present standard design of a circular pin, is inherently faulty, for the reason that any lateral displacement of the drawbar would tend to cause lateral wear, and possibly a bursting effect on the sides of the slot, at front and back ends of the cotter. In this particular case there were no signs of such wear on the slot, but there were very noticeable signs of wear and bruising on one side of the shank, about the locality of the headstock guide plate; such wear may have been either the result of the slot fracture on one side only, or may have been a contributory cause thereof. On the other hand it may have been the result of the fact that the slot was not centrally located in the bar.

View of some of the wreckage after the accident

Recommendations and Remarks

Reports of coupling failures during the war have been limited to cases causing serious accident or substantial traffic delay. For the last full year before the war, failures on goods trains included 1,607 cases of fracture of drawbars and 786 of coupling links. The total number of similar failures had shown a continuous and substantial reduction from 3,488 and 1,619 in 1928, to 2,439 and 1,071 in 1933, and to the figures quoted above in 1938. None of the above figures includes failures which take place during shunting operations so that the total, although substantially reduced during the years before the

war, is still sufficient to present a serious problem in potentialities for accident. Every practicable step is necessary to ensure that drawgear does not fall below the standards prescribed for strength and wear.

In Sir Alan Mount's report on the accident at Dagenham Dock in 1931, which originated in the broken drawbar of a private-owner's wagon, recommendations were made with a view to enhancing the reliability of wagon drawgear in general. Among other recommendations, as to the prohibition of welding and the increase of tensile strength, both of which were adopted and embodied in a Railway Clearing House circular of 1934, was the following:—

"It should also be possible to effect reduction in the number of fractures of drawgear by the exercise of stricter supervision and control of repairs.

"For instance, subject to adequate notice, the 7-yearly overhaul, which has now been introduced for private-owners' wagons, would seem to afford an appropriate opportunity for considering—as a condition of fitness for continued use—the replacement of any portion of drawgear which might fail to comply with a suitable specification."

The circumstances of this drawbar failure appear to indicate the necessity for a further tightening of the procedure for inspection of wagon drawgear during periodical overhauls, and Colonel Trench thinks that the attention of the companies generally should be drawn to this point. The L.M.S.R. has already given instructions for a special examination of the drawgear on all old L. & Y.R. wagons as and when the vehicles are stopped at outstation depots for repairs.

This accident raises again the question of the use of flares or similar devices for giving immediate warning of an obstruction. Present arrangements provide for the use of detonators, but their value obviously depends on there being time for a man to lay them on the line at adequate braking distance from an obstruction. A flare on the other hand gives immediate, though temporary, warning at whatever distance local conditions may permit of its being seen and identified by an approaching driver. There is a majority of cases in which it is evident that flares would not be a satisfactory substitute for detonators, so that any proposal for flares could only be in addition to the present provision of arrangements for detonators. After the accident at Dinwoodie in 1928 exhaustive trials were carried out by the railway companies, but these resulted in a decision that the disadvantages did not justify their adoption.

Colonel Trench suggests that it would be worth making a new investigation to see whether recent developments in pyrotechnic equipment should modify this decision, in connection especially with one particular sphere of use, namely, as part of the engine equipment. The reason he does so for this particular case is that, in the event of derailment or collision on one track fouling the other track of a double line, the rear of the obstruction already has a first line of defence in the block, which should permit the guard to go back with detonators for a sufficient distance and thus provide the second line of defence. Against an approaching train on the opposite road there may be no protection, and, as in this case, no time for the enginemen to get detonators on to the rail at a distance sufficient to be of any value. It is possible that the driver or fireman of the express would have seen a flare in time to make a substantial reduction of speed before the collision.

The Coroner who held the inquest into the deaths in this accident reports that in a rider to its verdict the jury expressed the opinion that every signal box should be provided with a diagram showing the gradients in the section of railway worked from such box. The circumstances of this accident have drawn attention to the value of such a diagram or map, at any rate in signal boxes where gradients, catchpoints, acute curvature, or other physical conditions are such as may have a bearing on the operation of trains in normal or emergency conditions, and a study of it should be regarded as a regular part of the routine learning of a box by a new or relief signalman.

Transport of Roadstone by Rail

The Government programme for the repair of roads, announced in the Trunk Roads Act, 1946, calls for a new technique of resurfacing which will consume something like 200 tons of coated roadstone a day on a given project. The Great Western and the London Midland & Scottish Railways, which are the companies chiefly concerned with the transport of the material from the quarries, have held consultations with the Ministry of Transport and with industrial organisations concerned, to decide on methods of improving delivery and unloading, and both companies have designed skips or containers for carriage by rail and mechanical discharge.

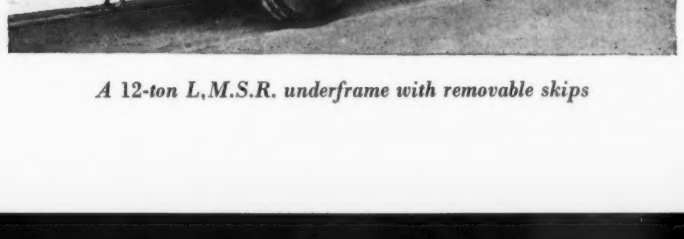
The L.M.S.R. has adapted a standard wagon underframe to carry four skips each of three tons capacity. No attachments are necessary to anchor the skips in position on the underframe, which facilitates unloading. A crane is used to raise the skips from the wagon, and when a skip has been hoisted level to a suitable height, a hinged catch at each side is knocked away so that the skip can be swivelled to discharge.

There are two hinged catches at each side of the skip, either of which can be knocked clear according to the direction of tipping required, the other remaining in position to act as a stop when the skip returns again to the upright position.

The skips weigh 9 cwt. 3 qr. each, and are of 77 cu. ft. internal capacity. They are constructed of $\frac{3}{16}$-in. mild-steel plate, with a trunnion at each end for tipping. It is contemplated that railway-owned cranage for purposes of discharge and the contractor's fleet of road vehicles would follow each job from railhead to railhead (probably at 20-mile intervals) along the line of route of the trunk road concerned.

The Great Western Railway has designed containers for the carriage of the coated roadstone, which are also suitable for general bulk traffic, and can be transported on an ordinary low-side four-wheel wagon. Each container will carry a load of 5 tons, is of 125 cu. ft. internal capacity, and has a tare weight of 18 cwt. 14 lb. The internal dimensions are 6 ft. 6 in. long, 6 ft. wide, and 3 ft. 3 in. deep. The frame is all-welded, and the floor, sides, and ends are of $\frac{3}{16}$-in. plate riveted to the frame. The containers are fitted with flap end doors, secured by pins which are knocked out for unloading. Three lifting rings are fitted at each end, so positioned that the containers can be hoisted with a tilt ready for discharge, or in a horizontal position when necessary.

L.M.S.R. Coated Roadstone Wagon



A 12-ton L.M.S.R. underframe with removable skips

SCOTTISH MACHINE TOOL CORPORATION.—The Scottish Machine Tool Corporation Limited has appointed Mr. Arthur White, 75, Wensley Road, Leeds, 7, as its representative for Yorkshire, Lancashire and the North East Coast.

RANSOME & MARLES BEARING CO. LTD.—Mr. W. H. Royall, who has been with Ransome & Marles Bearing Co. Ltd. for twenty years (the major portion in its technical drawing office and on the sales side), has assumed office as East Midland Area Manager. His appointment is consequent on the death during the war period of Mr. W. S. Walter. New offices have been opened at Nicholas House, 4, Great Central Street, Leicester (telephone: Leicester 65730 and 65739). Mr. Royall will be assisted on the sales side by Mr. J. R. H. Barefoot, and the office and stock room arrangements will be the responsibility of Mr. W. S. Welby.

The 2,000th Locomotive from Doncaster Works

On May 22 the Doncaster Works of the L.N.E.R. celebrated the production of the 2,000th locomotive to be built at the works since its formation 79 years ago. It is No. 500 and is a 4-6-2 express passenger locomotive which is to be classified "A2." Previous class "A2" locomotives have been conversions and No. 500 is the first locomotive of the class to be built as such. It is a 3-cylinder locomotive (each 19 in. dia × 26 in. stroke) and has 6 ft. 2 in. driving wheels. Boiler pressure

Mr. A. H. Peppercorn in the cab of No. 500

is 250 lb. per sq. in. and tractive effort is 40,430 lb. Unlike the pre-war L.N.E.R. 3-cylinder locomotive, No. 500 has a separate set of Walschaerts valve gear for each cylinder. This arrangement enables a larger valve (10 in. dia.) to be used, and maintains a better steam distribution over the period between major repairs than was feasible with the previous arrangement of conjugated gear to the inside valve. The total weight in working order of the engine without tender is 101 tons 10 cwt., which allows for an adhesive weight of 66 tons. It is fitted with a standard L.N.E.R. non-corridor 8-wheel tender which weighs 60 tons 7 cwt. in working order.

Doncaster Works was built in 1853 by the Great Northern Railway. In 1867 the Doncaster shops were enlarged so that the construction of locomotives could be undertaken there, instead of at outside contractors' works. In the same year the first Doncaster-built locomotive, an 0-4-2, intended for mixed-traffic service and bearing the number 18, was completed to the design of Patrick Stirling, then Locomotive Superintendent. When first opened Doncaster Works covered 11½ acres and employed 950 men. By the end of 1926, four years after the formation of the L.N.E.R., the area of Doncaster Works, excluding sidings, had reached 84 acres, 19 of which were covered by workshops. During the recent war there was a temporary reduction in workshop acreage, as a result of the burning out of the carriage body shop, but new shops are being planned to replace the loss. In 1926 the number of men employed had risen to 2,516 in the locomotive shops, 1,172 in the carriage shops and 669 in the wagon shops, a total of 4,357.

In one respect Doncaster Works possesses an almost unique feature. During the 76 years' life of the Great Northern Railway Company there were only four Locomotive Superintendents:—

A. Sturrock	... ...	1850 to 1866
P. Stirling	... ...	1866 to 1895
H. A. Ivatt	... ...	1896 to 1911
H. N. Gresley	...	1911 to 1922

On January 1, 1923, the London & North Eastern Railway was formed and Mr. Gresley (later Sir Nigel Gresley) was appointed to continue office for the new company with the title of Chief Mechanical Engineer. At his death in 1941 Mr. Edward Thompson succeeded him and is the present holder of the office. Thus, in nearly a century only four changes in the Chief Officer have taken place. At the present time Doncaster is responsible for the maintenance of 1,290 locomotives, in addition to coaching stock and wagons, more than one-fifth of the L.N.E.R. total stock of locomotives.

Among those present at the inspection of locomotive No. 500 were:

Messrs. A. H. Peppercorn (Assistant Chief Mechanical Engineer); L. Reeves (Mechanical Engineer, Doncaster); J. Blair (Mechanical Engineer, Outdoor); J. C. Spark (Locomotive Works Manager, Doncaster); George Dow (Press Relations Officer); G. A. Musgrave (Locomotive Running Superintendent, Western Section, Southern Area); and E. Windle (Chief Draughtsman, C.M.E's. Office, Doncaster).

Parliamentary Notes

Great Western Railway Bill

The Great Western Railway Bill was reported, with amendments, to the House of Lords on May 9. It was read the third time, with the amendments, and passed on May 21.

Questions in Parliament

Railway Fares

Mr. J. L. Williams (Glasgow, Kelvingrove—Lab.) on May 27 asked the Minister of Transport what proposals he had recently received for an increase in railway fares.

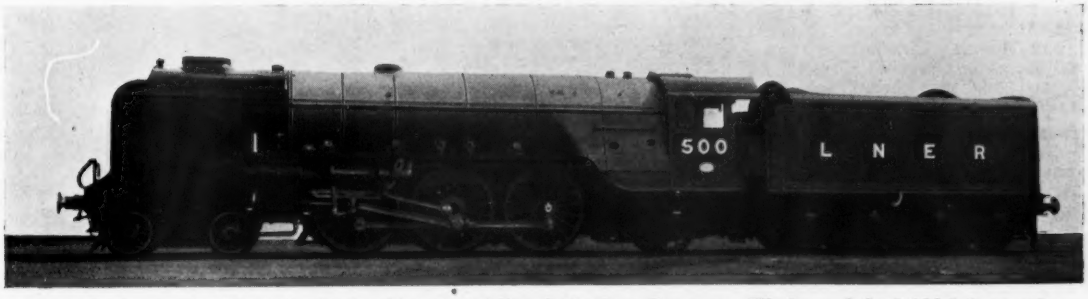
Mr. Alfred Barnes: I hope to make a statement at an early date.

Central Uruguayan Railway

Wing-Commander E. R. Millington (Chelmsford—Lab.) on May 6 asked the Secretary of State for Foreign Affairs if he was aware that the Uruguayan Chamber of Deputies was now conducting an investigation into alleged frauds against currency regulations, of which a British subject, Mr. H. H. Grindley, of the Uruguayan Railway, was accused, and that he claimed to be an employee of his department; what official post was occupied by Mr. Grindley; and whether he would give an assurance that his regulations made clear to all employees of his department in foreign countries that infringement of the currency regulations of those countries would at once be punished.

Mr. Hector McNeil (Under-Secretary of State for Foreign Affairs) in a written answer stated: I am aware that a committee was appointed by the Uruguayan Chamber in December, 1945, to investigate allegations that the Central Uruguayan Railway, of which Mr. Grindley is General Manager at Montevideo, had been guilty of irregularities in obtaining and disposing of funds from the exchange quota established by the Anglo-Uruguayan Trade & Payments Agreement of 1935. The report of this committee is still awaited, although it was established some 2½ years ago. I am not, however, aware that Mr. Grindley has claimed that he is employed by the Foreign Office. Certainly he holds no official post. As regards the last part of the question, the infringement by members of His Majesty's Foreign Service of the laws and regulations of the foreign countries where they reside would be a matter for appropriate disciplinary action. I have no reason to suppose that members of His Majestys' missions abroad are not fully aware of their obligation to observe the laws and regulations in force in such countries, or that they fail in this elementary duty.

L.N.E.R. 4-6-2 Class "A 2" Locomotive, No. 500—Doncaster's 2,000th



L.N.E.R. locomotive No. 500, *the first class "A 2" to be built at Doncaster Works and the* 2,000*th locomotive to be produced there*

Notes and News

South African Railway Earnings.—Railway earnings in South Africa for the period April 7 to May 4 amounted to £4,256,525, compared with £4,002,165 in the previous corresponding period.

Cost-of-Living Index.—At May 1 the official cost-of-living index figure was 104 points above the level of July, 1914, compared with 103 points a month earlier. At May 1, 1939, it was 53 points above July, 1914.

Eastern Bengal Railway Company.—It was notified recently in *The London Gazette* that on March 31, 1946, a total sum of £1,101,266 15s. 4d. was invested for the purpose of providing a sinking fund in respect of the annuities class "B."

Agreed Charges.—Applications for the approval of 37 further agreed charges under the provisions of Section 37 of the Road & Rail Traffic Act, 1933, have been lodged with the Railway Rates Tribunal. Notices of objection must be filed on or before June 11 next.

District Locomotive Superintendent Required.—A district locomotive superintendent is required by a British railway in Africa. Candidates should have the following qualifications, A.M.I.Mech.E., or B.Sc. (Eng.), and have completed apprenticeship in workshops of a railway or one of the larger locomotive builders. For full particulars see Official Notices on page 611.

Accounting Assistant Required.—An accounting assistant is required by the Tanganyika Railways & Ports Services, for one tour of 24 to 36 months in the first instance. Candidates, not over 30, must have had a good general experience in the Traffic Department of a home railway in the compilation of passengers, parcels, and goods station accounts. See Official Notices on page 611.

Standing Passengers and L.P.T.B. Country Services.—The L.P.T.B. announced recently that, on and from May 20, it was proposed to revert to the pre-war practice whereby up to five standing passengers would be carried in country buses and coaches during peak hours, those periods to be defined in relation to local traffic conditions. In addition, standing passengers would be carried in circumstances in which undue hardship would be caused to such passengers if they were not carried on the vehicles.

L.M.S.R. to Decorate Forty Stations for Victory Day.—The L.M.S.R. is to arrange display schemes of flags and bunting at 15 of its principal stations on Victory Day (June 8) and subsidiary decorations at 25 other stations. Those where the largest displays will be made are at Euston, St. Pancras, Liverpool (Lime Street and Exchange), Manchester (Exchange, London Road and Victoria), Birmingham, Crewe, Derby, Sheffield, Glasgow (Central, St. Enoch, and Buchanan Street) and Edinburgh (Princes Street).

Derwent Valley Light Railway Company.—The financial accounts and statistical returns for the year ended December 31, 1945, are presented in the full statutory form. Net receipts from the railway and from the collection and delivery of parcels and goods were £3,743, as against £5,849. Miscellaneous receipts contributed £906, as against £1,024, and the addition of £4,649 from taxes and tithe redemption annuities gives a total net revenue of £7,926, comparing with £6,873 in 1944. The balance available for dividends and general reserve is £7,816, from which the directors recommend the allocation of £2,000 to general reserve, as against £1,000 last year, and dividends of 5 per cent. on the preference shares and ordinary stock as in 1944. The balance carried forward of £1,766 compares with £1,555.

Bruce Peebles & Co. Ltd.—Profit for the year, after taxation, was £20,367, compared with £42,554 in 1944. General reserve receives £10,000, and dividends of 10 per cent. on the preference stock and 5 per cent. plus a 3 per cent. bonus on the ordinary stock take £9,665, leaving a balance of £702. Adding £15,506 from 1944, £16,208 is carried forward.

City of Oxford Motor Services Limited.—After providing £170,000 for taxation, the accounts for the year ended December 31, 1945, show a profit of £20,809. The addition of £8,386 from the accounts for the previous year makes a total of £29,195. Dividend on the 6½ per cent. cumulative preference shares, less income tax, takes £2,405, and a dividend of 8 per cent., free of income tax, on the ordinary shares requires £18,080, leaving £8,710 to be carried forward.

Vickers Limited.—The directors of Vickers Limited have declared a final dividend of 6 per cent. on the ordinary capital, making, with the interim, 10 per cent. for the tenth consecutive year. Net profit for 1945, after providing for taxation, is shown in the preliminary statement as £971,509, a decrease of £130,303 compared with the previous year. The allocation to contingencies is maintained at £250,000, and £19,827, against £19,064, is transferred to the sinking fund for redemption of the 4 per cent. first debentures, leaving £1,073,704, or £63,270 more, to be carried forward.

Prestatyn Holiday Camp Re-opening.—The Prestatyn Holiday Camp, which is owned by British Holiday Estates Limited, a subsidiary of Thomas Cook & Son Ltd., and was opened on June 1, 1939, and commandeered by the War Department on September 1 of that year, is being reopened to the public on June 1. The camp was built at a capital outlay of just over £250,000 and covers an area of 55 acres. Certain vital repairs have been authorised to enable the camp to function on an austerity basis during 1946. Accommodation consists of over 850 chalets, of which 360 are single chalets, the balance being double and family type chalets. The camp was originally built to accommodate 1,750 people and designed for expansion to 2,000 people. For the coming season only the accommodation is restricted to 1,300.

Reorganisation of L.M.S.R. Motive Power Districts.—The formation of new motive power districts for Bletchley and Blackpool is a feature of a partial reorganisation of motive power districts which came into effect on the L.M.S.R. on May 6, 1946. Details of the alterations are as follow; the code identification of the depots concerned is shown in brackets after the name of each depot:—

Bletchley District, formed of Bletchley (2B), Oxford (2B), Newport Pagnell (2B), Cambridge (2B), Aylesbury (2B), and Northampton (2C). Until this reorganisation, Northampton came within the Rugby District. The separate depot number (2G) for Leighton Buzzard sub-depot has been discontinued.

Rugby District, comprising Rugby (2A), Market Harborough (2A), Seaton (2A), Nuneaton (2D), Warwick (2E), and Coventry (2F).

Blackpool District, formed by depots transferred from the Accrington District, namely, Blackpool Central and Blackpool North (24E), and Fleetwood (24F).

Accrington District, formed by Accrington (24A), Rose Grove (24B), Lostock Hall (24C), and Lower Darwen (24D). Lostock Hall depot is transferred from the Bank Hall district.

Bank Hall District, consisting of Bank Hall (23A), Aintree (23B), Southport (23C), and Wigan Central (23D).

The shed number "23E" previously borne by Lostock Hall is deleted from the L.M.S.R. shed code.

British and Irish Railway Stocks and Shares

Stocks	Highest 1945	Lowest 1945	Prices May 28 1946	Prices Rise/Fall
G.W.R.				
Cons. Ord.	60⅜	47½	59½	— 1
5% Con. Pref. ...	124½	104½	117	— ⅜
5% Red. Pref. (1950)	107⅜	101½	104½	+ ⅛
5% Rt. Charge ...	137½	120	129½	+ 1
5% Cons. Guar. ...	135½	117	126½	
4% Deb.	118	106	116	+ ½
4½% Deb.	119½	108	115½	—
4½% Deb.	124½	111½	120	—
5% Deb.	138	124	130	+ 1
2½% Deb.	83	74½	86½	—
L.M.S.R.				
Ord.	33	23¼	28	— ⅛
4% Pref. (1923) ...	65	50	58½	— 1
4% Pref.	80¾	69¼	83½	— ⅛
5% Red. Pref. (1955)	106½	99¾	103½	—
4% Guar.	106½	97	105½	— 1
4% Deb.	110½	102	111	— 1
5% Red. Deb. (1952)	110½	103½	106½	+ ½
L.N.E.R.				
5% Pref. Ord. ...	8½	5½	5⅞	— ⅛
Def. Ord.	4½	2½	2⅝	— ⅛
4% First Pref. ...	62½	49½	58	— 1
4% Second Pref. ...	33¼	24½	28	— ⅛
5% Red. Pref. (1955)	103	96	100	+ 1
4% First Guar. ...	104½	95	104½	— 1⅛
4% Second Guar. ...	97	89½	98	— ½
3% Deb.	91½	82½	96½	—
4% Deb.	109½	101	111	— ½
5% Red. Deb. (1947)	103½	100	100	—
4½% Sinking Fund Red. Deb.	106⅜	103	104½	—
SOUTHERN				
Pref. Ord.	79½	63	78	— ½
Def. Ord.	27	20⅛	21½	— ¼
5% Pref.	124½	104	116	— 1
5% Red. Pref. (1964)	117	107	110½	—
5% Guar. Pref. ...	135¾	117	125½	—
5% Red. Guar. Pref. (1957)	117	106½	112½	+ 2
4% Deb.	117	104½	115	+ ½
5% Deb.	137	124	128½	—
4% Red. Deb. (1962-67)	112	104½	109½	—
4% Red. Deb. (1970-80)	113½	104	110½	+ 1
FORTH BRIDGE				
4% Deb.	106	103	105	—
4% Guar.	106	101	104	—
L.P.T.B.				
4½ "A"	125	117	125½	—
5% "A"	135	127	134½	—
3% Guar. (1967-72)	100	97½	105	+ ½
5% "B"	125½	115	121½	+ 1½
"C"	70	58	62	—
MERSEY				
Ord.	37	31½	30½	—
3% Perp. Pref. ...	72½	68½	72	—
4% Perp. Deb. ...	104½	104	105	—
3% Perp. Deb. ...	84	78½	82½	—
IRELAND*				
BELFAST & C.D.				
Ord.	8⅛	6	7½	—
G. NORTHERN				
Ord.	34	24½	38½	+ 1
Pref.	52½	42¾	58	—
Guar.	80	68	88	—
Deb.	97½	87½	101½	—
IRISH TRANSPORT				
Common	—	—	17/6	—
3% Deb.	—	—	103	—

* Latest available quotation

OFFICIAL NOTICES

WANTED by a British Railway in Africa a District Locomotive Superintendent, age 35/40 years. The post offers excellent prospects for early promotion and candidates should have the following qualifications: (1) A.M.I.Mech.E., or B.Sc. (Eng.); (2) have completed apprenticeship in workshops of a Railway or one of the larger Locomotive Builders; (3) had experience in executive capacity in Railway General Repair Workshops and/or Locomotive Carriage and Wagon Running Maintenance. Commencing salary: £800 p.a. Free unfurnished quarters, medical attention and passages. Successful candidate will be required to join the Administration Pension Scheme.—Written applications, giving Age, Name, Nationality, M. or S., details of training and subsequent career to date, with copies of testimonials, to be sent to "M.N.," c/o J. W. Vickers & Co. Ltd., 7/8, Great Winchester Street, London, E.C.2.

THE "PAGET" LOCOMOTIVE. Hitherto unpublished details of Sir Cecil Paget's heroic experiment. Eight single-acting cylinders with rotary valves. An application of the principles of the Willans central-valve engine to the steam locomotive. By James Clayton, M.B.E., M.I.Mech.E. Reprinted from *The Railway Gazette*, November 2, 1945. *Price* 2*s*. *Post free* 2*s*. 3*d*.

Locomotive Building Industry in India

TATA LOCOMOTIVE & ENGINEERING COMPANY LTD.

WORKS SUPERINTENDENT required for an up-to-date Locomotive Boiler-building Plant now being established at Jamshedpur, Behar, India.

The post carries a salary of £2,000 to £2,500 per annum. It offers an excellent opportunity to a man of capacity and ambition, with good prospects for a "live" man. The present rate for Indian Income Tax on the salary offered is only about one-half the corresponding rate in the U.K. Passages out and Home will be provided and assistance will be given in arranging passages for the family of a married man. Quarters at a reasonable rent will be provided and free medical attention. One month's leave on FULL PAY yearly.

Applicants, who should be between 35 and 45 years of age, should have had a sound training and good subsequent experience in locomotive building, including boilers, and should be ready and able to take responsibility.

Applications, which will be treated in strict confidence and should, if possible, be accompanied by *copies* of testimonials and certificates, should be made to the under-noted address and marked "Works Superintendent." Messrs. Tata Limited, 18, Grosvenor Place, London, S.W.1.

Crown Agents for the Colonies

COLONIAL GOVERNMENT APPOINTMENTS.

APPLICATIONS from qualified candidates are invited for the following post:—

ACCOUNTING ASSISTANT required for Accounts Department, Tanganyika Railways and Ports Services, for one tour of 24 to 36 months in the first instance. Salary: £300, rising to £480 a year, commencing salary according to qualifications, experience and war service. Cost-of-living allowance payable at current rates. Outfit allowance £30. Free quarters and passages. Candidates, not over 30, must have had a good general experience in the Traffic Department of a Home Railway in the compilation of Passengers, Parcels and Goods Station accounts. Apply at once by letter, stating age, whether married or single, and full particulars of qualifications and experience to the Crown Agents for the Colonies, 4 Millbank, London, S.W.1, quoting M/N/16281.

THE RAILWAY SYSTEM OF JAMAICA. A general description of the system and its traffics, with an account of economic problems; the motive power used; and some features of operation. By H. R. Fox, B.Sc., M.Inst.C.E., General Manager, Jamaica Government Railway. Reprinted from *The Railway Gazette*, January 5 and 12, 1945. *Price* 1*s*. *Post free* 1*s*. 2*d*.

Southampton Docks (Increase of Charges).—The Minister of Transport on May 16 made the Southern Railway—Southampton Docks—(Increase of Charges) Order, 1946. Copies may be obtained from the Ministry of Transport.

G.W.R. Victory Whitsun Arrangements.—The G.W.R. plans to run 198 additional main-line trains during the Victory Whitsun holiday. Duplication of main-line trains begins on Thursday, June 6; on Friday and Saturday, June 7 and 8, 27 extra long-distance trains will leave Paddington for the West Country, the Midlands, South Wales and the North. On June 8, eight additional express services will arrive at Paddington in the morning and early afternoon. For the convenience of London suburban passengers, additional late trains will be run as necessary for stations to Slough. Refreshment facilities will be available throughout the night at Paddington. The G.W.R. staff band will play in Paddington Station from 7 p.m. until 9 p.m. on Saturday, June 8, and on Sunday morning. Ordinary services will operate on Whitsun Monday, with the cancellation of some workmen's and early morning business trains. A number of extra local services from Paddington to the Thames Valley will be run. Principal late afternoon and evening long-distance runs from Paddington will be duplicated.

Harwich-Zeebrugge Train Ferry Service.—The L.N.E.R. announces that it has agreed to re-purchase its Train Ferry No. 1, which was acquired by the Government during the war. This vessel, renamed *Princess Iris* while on Naval service, is the only surviving unit of the L.N.E.R. train ferry fleet which operated the Harwich-Zeebrugge service. She is being handed over to John Brown & Co. Ltd., Clydebank, for re-conditioning, and, it is expected, will be available for re-opening the service in about two months' time, in advance of delivery of the new train ferry, a contract for which already has been placed with the Clydebank firm.

Train Hits Buffers at Blackpool North, L.M.S.R.—It is reported that some passengers were injured and that three ticket collectors had narrow escapes on May 25 when a train hit the buffers at Blackpool North Station, L.M.S.R.

G.W.R. Re-Opening Vale of Rheidol Railway.—The G.W.R. narrow-gauge Vale of Rheidol Light Railway will be open daily to holidaymakers for the first time for six and a half years beginning on June 9. The line is twelve miles long, and runs from Aberystwyth to Devils Bridge through beautiful wooded scenery. The coaches were specially built to give a wide and uninterrupted view of the many scenic beauties.

London Transport Station Proficiency Competition

Silver shields and cash prizes were recently presented to the winners in the L.P.T.B. Station Proficiency Competition. The prize winning stationmasters are shown above, with Mr. J. H. Brebner, Chief Public Relations & Publicity Officer, L.P.T.B.

Left to right: Mr. Kamp (Kennington), Mr. Ishbel (Swiss Cottage), Mr. Barker (Hammersmith), Mr. Baker (Northfields), Mr. J. H. Brebner, Mr. McCleod (Piccadilly), Mr. Brooker (Oxford Circus), Mr. Brown (Enfield West), Mr. Ferry (Aldgate East), and Mr. Brundell (East Finchley)

Railway Stock Market

Business in stock markets underwent contraction, buyers holding off in view of home and international political uncertainties. British Funds were inclined to ease after the better tendency which developed at the end of last week, but generally there was little selling, and industrial shares, despite their recent good upward movement, encountered only moderate profit-taking. In fact, there were a number of good industrial features, notably Dunlop Rubber on the full results and forthcoming refinancing plans, and Lever N.V., the latter pending the dividend statement, Lever & Unilever moving up in sympathy.

There were many factors affecting various sections; textiles were under the influence of the report of the Cotton Working Party, and iron and steels showed sharp movements on the news of the extent of the Government's nationalisation plans. Shares of producers of pig iron and steel ingots and those of other companies which appear to fall into the Government's nationalisation categories, moved back, including United Steel, Thomas & Baldwins, and Consett Iron, Colvilles, Stewarts and Lloyds, Guest, Keen, and Hadfields were easier, as some sections of their activities may be nationalised according to current market views.

On the other hand, Babcock & Wilcox, Tube Investments, T. W. Ward, Whitehead Iron, and Hawthorn Leslie were among shares which were inclined to rally on the belief that their activities will not be nationalised. It is felt, however, that until the Government's full proposals are known, it is difficult to form a satisfactory basis for valuing iron and steel shares; although, generally, current prices may very well prove moderate, assuming a fair compensation basis for shareholders in companies coming into the grip of nationalisation.

Home rails reflected the easier and hesitant tendency of markets, prices easing because of falling off in demand, and in the absence of renewed strength in British Funds, prior charges, including senior preference and guaranted stocks, have been less firm. Junior stocks were inclined to strengthen at the beginning of the week in anticipation of higher railway charges and fares; but the latter induced little buying, nationalisation uncertainties again coming to the forefront; although there is general confidence in a fair compensation basis for stockholders and a widespread impression that the latter would show prices well above current levels to be justified, particularly in regard to junior stocks and also those preference stocks which are well under their par value.

Investors are aware that higher railway charges and fares will in no way increase the fixed rental received by the railways under the existing control agreement. On the other hand, the recent trend in traffics makes depressing reading; and with charges adjusted to meet in some measure the big rise in the cost of labour and materials, traffics should make a better showing and give a fairer indication of the true earning power of the railways.

Compared with a week ago, Great Western has slipped back from 60¾ to 59½, and the 5 per cent. preference at 117 was fractionally lower, as was the guaranteed stock at 126; but the 4 per cent. debentures have improved further from 115½ to 116. Reflecting the prevailing trend, L.M.S.R. has gone back from 28⅝ to 28¼, the 1923 preference from 59 to 58½, and the senior preference from 84 to 83½; the 4 per cent. debentures lost a point at 111. Elsewhere, L.N.E.R. second preference at 28 was ½ down on balance, and at 58 the first preference lost a point; the first guaranteed at 105 and the second guaranteed at 97½ were also a point below the levels of a week ago, and at 111 the 4 per cent. debentures showed a similar decline.

Southern deferred receded from 21¾ to 21⅜, and the preferred from 78½ to 78; moreover, the 5 per cent. preference went back from 117½ to 116, although at 115 the 4 per cent. debentures moved slightly above the level of a week ago. London Transport has again been in better demand, gaining a point at 62. Metropolitan Assented was firmer at 55.

Argentine rails have been steadier with a tendency to await news as to when talks with the Argentine authorities are likely to be resumed. Buenos Ayres Great Southern at 11½ was unchanged on balance, as was the 5 per cent. preference at 26½; improvement from 67½ to 68¾ was recorded by the 4 per cent. debentures.

Buenos Ayres Western further strengthened to 12¼, and the 4 per cent. debentures were 64¼. Central Argentine stocks were also better. In anticipation of the results, Antofagasta ordinary and preference improved. Leopoldina 4 per cent. debentures were firm at 59½ on the interest payments for 1945. Canadian Pacifics rallied following the application for higher railway charges.

Traffic Table and Stock Prices of Overseas and Foreign Railways

	Railways	Miles open	Week ended	Traffic for week: Total this year	Traffic for week: Inc. or dec. compared with 1944/5	No. of Weeks	Aggregate traffics to date: Totals 1945/6	Aggregate traffics to date: Totals 1944/5	Aggregate traffics to date: Increase or decrease	Shares or Stock	Prices: Highest 1945	Prices: Lowest 1945	Prices: May 28, 1946
				£	£		£	£	£				
South & Central America	Antofagasta	834	19.5.46	33,730	+ 2,570	20	661,300	602,390	+ 58,910	Ord. Stk.	12	8¾	11
	Arg. N.E.	753	18.5.46	ps.289,200	– ps.2,800	46	ps.13,605,700	ps.13,636,400	– ps.30,700	,,	10	5½	5
	Bolivar	174	Apr., 1946	4,287	– 610	17	18,402	20,965	– 2,563	6 p.c. Deb.	8¼	5½	6½
	Brazil	—	—	—	—	—	—	—	—	Bonds	25	17	28
	B.A. Pacific	2,771	18.5.46	ps.2,342,000	+ps.142,000	46	ps105,363,000	ps.101,224,000	+ ps.4,139,000	Ord. Stk.	7	5	6
	B.A.G.S.	5,080	18.5.46	ps.3,417,000	+ps.203,000	46	ps164,873,000	ps.154,372,000	+ ps.10,501,000	Ord. Stk.	13⅜	10¼	11½
	B.A. Western	1,924	18.5.46	ps.1,378,000	+ps. 55,000	46	ps.55,462,000	ps.52,089,000	+ ps.3,373,000	,,	12¼	9½	12½
	Cent. Argentine	3,700	18.5.46	ps.3,132,720	+ps.281,670	46	ps145,329,696	ps.132,945,950	+ps.12,383,746	,,	9¾	7	7¾
	Do.	—	—	—	—	—	—	—	—	Dfd.	5	2⅜	3½
	Cent. Uruguay	970	18.5.46	47,191	+ 6,717	46	1,826,181	1,603,347	+ 222,834	Ord. Stk.	7½	4	7¼
	Costa Rica	262	Mar., 1946	30,768	– 34	38	252,872	203,304	+ 49,568	Stk.	16½	13	12½
	Dorada	70	Mar., 1946	26,161	+ 2,061	13	85,975	82,705	+ 3,270	1 Mt. Deb.	103	102	101½
	Entre Rios	808	18.5.46	ps.442,000	–ps.18,200	46	ps.19,552,100	ps.18,296,300	+ ps.1,255,800	Ord. Stk.	7½	4½	5½
	G.W. of Brazil	1,030	18.5.46	24,900	+ 2,500	20	589,500	523,200	+ 66,300	Ord. Stk.	30/–	23/6	25/6
	Inter. Ctl. Amer.	794	Apr., 1946	$963,780	+$135,112	17	$3,878,475	$3,109,079	+ $769,396	—	—	—	—
	La Guaira	22¾	Apr., 1946	5,488	– 1,018	17	22,338	22,416	– 78	5 p.c. Deb.	78	70	61½
	Leopoldina	1,918	11.5.46	53,329	+ 8,641	19	1,076,783	845,449	+ 231,334	Ord. Stk.	4¼	3½	3¾
	Mexican	483	21.5.46	ps.937,000	+ps.258,800	20	ps.17,053,800	ps.12,436,700	+ ps.4,617,100	Ord. Stk.	¼	¼	1
	Midland Uruguay	319	Apr., 1946	16,340	– 2,535	40	180,630	175,706	+ 4,924	—	—	—	—
	Nitrate	382	15.5.46	7,123	– 2,220	19	83,031	68,100	+ 14,931	Ord. Sh.	75/6	67/6	77 6xd
	N.W. of Uruguay	113	Apr., 1946	4,902	– 720	40	54,275	56,659	– 2,384	—	—	—	—
	Paraguay Cent.	274	17.5.46	£85,650	+ £720	46	£2,804,274	£2,785,995	+ £18,279	Pr.Li.Stk.	79⅞	77	75½
	Peru Corp.	1,059	Apr., 1946	149,091	+ 23,048	40	1,401,933	1,296,522	+ 105,411	Pref.	10⅜	7⅜	11¼
	Salvador	100	Mar., 1946	c 175,000	– c 27,000	36	c 1,255,000	c 1,159,000	+ c 96,000	—	—	—	—
	San Paulo	153¼	—	—	—	—	—	—	—	Ord. Stk.	60½	50½	56
	Taltal	156	Apr., 1946	5,180	+ 2,270	44	33,200	26,280	+ 6,920	Ord. Sh.	17/–	10/6	17 9
	United of Havana	1,301	18.5.46	68,366	+ 19,628	46	2,703,777	2,505,554	+ 198,223	Ord. Stk.	3	1	1¼
	Uruguay Northern	73	Apr., 1946	1,582	– 381	40	17,349	16,259	+ 1,090	—	—	—	—
Canada	Canadian National	23,569	Apr., 1946	6,282,200	– 868,200	17	24,754,000	27,319,000	– 2,565,000	—	—	—	—
	Canadian Pacific	17,037	21.5.46	995,000	– 222,000	20	21,766,200	23,537,400	– 1,771,200	Ord. Stk.	24	14⅜	24
Various	Barsi Light†	202	Mar., 1946	34,282	+ 7,537	52	312,315	269,828	+ 42,487	Ord. Stk.	131	123	112½
	Beira	204	Mar., 1946	95,726	+ 18,585	24	433,354	463,719	– 30,365	—	—	—	—
	Egyptian Delta	607	20.4.46	16,465	– 1,474	3	33,174	36,015	– 2,841	Prf. Sh.	10	8½	5
	Manila	—	—	—	—	—	—	—	—	B. Deb.	71	55½	71½
	Mid. of W. Australia	277	Mar., 1946	18,366	+ 431	36	152,484	173,275	– 20,791	Inc. Deb.	97½	85	75
	Nigeria	1,900	Feb., 1946	350,919	– 35,117	46	3,153,983	3,515,685	– 361,702	—	—	—	—
	Rhodesia	2,445	Mar., 1946	518,137	+ 24,815	24	2,994,201	3,020,127	– 25,926	—	—	—	—
	South African	13,301	13.4.46	1,094,466	+ 51,560	2	2,130,360	1,948,345	+ 182,015	—	—	—	—
	Victoria	4,774	Jan., 1945	1,204,720	– 75,151	—	—	—	—	—	—	—	—

† Receipts are calculated @ 1s. 6d. to the rupee